MARCH 1952

THE SCIENCE TEACHER

- Some Characteristics of Science Teachers
- The Need for Sex Education in the High School
- Instructional Materials for the Physical Sciences
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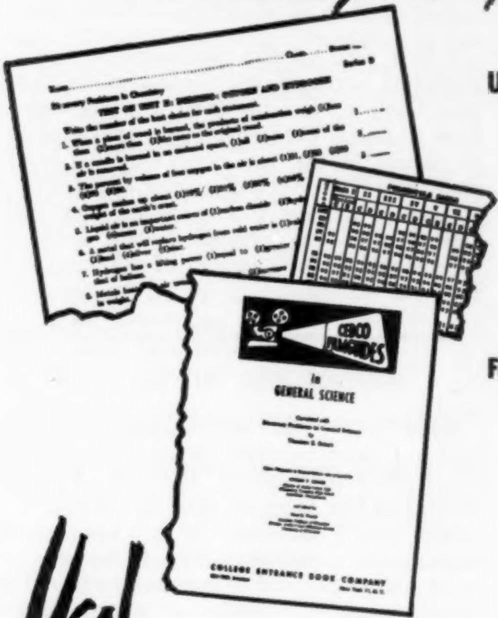

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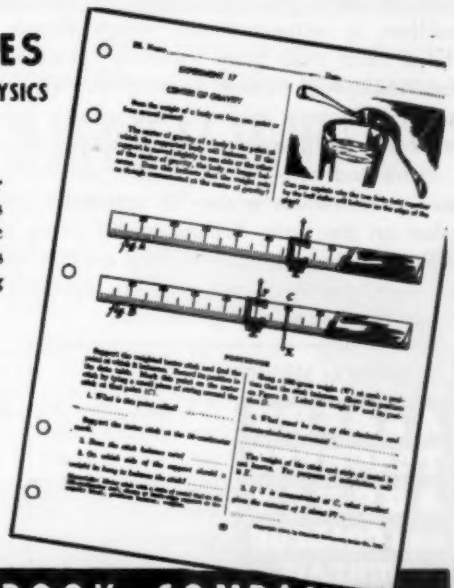

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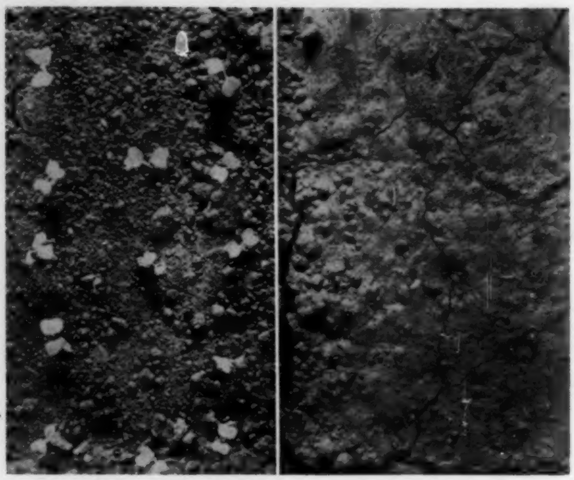

THIS MONTH'S COVER . . . shows the growth of radishes in untreated soil, right, and in soil treated with Krilium; at the left. Developed by Monsanto Chemical Company, Krilium is a new synthetic soil conditioner (not a fertilizer) that radically improves the physical structure of the soil by the formation of discrete soil aggregates. Described as "a synthetic organic chemical, a polyelectrolyte," Krilium is reported to be 100 to 1000 times as effective as compost, peat moss, or manures in improving soil structure. Its announcement by Monsanto at the AAAS meeting in Philadelphia last December was generally conceded by science news writers as "top news" of the week. Note the sparse germination of the radishes in untreated soil which shrank and dried to a hard crust from watering. Greater germination resulted in Krilium treated soil which was watered in the same manner. The young lady on the cover? She is displaying some beautiful tomatoes grown in treated soil—in the basket on the left—compared to tomatoes grown in untreated soil—in the basket on the right. Krilium is still being tested for home gardening, agriculture, and erosion control. Another year, perhaps, will see the synthetic soil conditioner in commercial production.

Guided Missives

I have received the two books you are sending to sustaining members, one a contribution from the Upjohn Company and the other a contribution from the Dow Chemical Company. I am writing personal notes of thanks to the two companies. No teacher could read these books without gaining added respect for the companies and the two industries they represent. If only more of our industrial leaders would contribute such things as these instead of asking: What's wrong with our schools?

E. W. Blackstone, *Principal and Science Instructor*
McArthur, Ohio, Schools

Since taking out my student membership with NSTA I have received the October and November issues of The Science Teacher, Packet Number XVII, and *The Story of Asbestos Textiles*. It was with delight that I examined the journals and the other printed matter, visualizing the aid which they will afford me in illustrations and demonstrations during the forthcoming years. The service of your association must surely do much to help young people embarking on a science teaching career. I would like to wish success and progress for the association during 1952.

John J. Little
Hurlstone Park
Sydney, Australia

. . . All the science teachers of our school (Lanier Senior High) have been members of NSTA for several years. The Association is doing a wonderful job for teachers and students. We look forward to each packet and journal.

Marvin J. Jones
Macon, Georgia

THE SCIENCE TEACHER

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in the April issue of *The Science Teacher*

- College Board Examinations in Science
- The West Coast Nature School
- Supplies for Elementary School Science
- 1952 Summer Conference, June 26–28, University of Michigan
- Ballot, Election of Officers and Directors for 1952–53

THE SCIENCE TEACHER

The National Science Teachers Association is a Department of the National Education Association and an Affiliate of the American Association for the Advancement of Science. Established in 1895 as the NEA Department of Science Instruction, the Association later became the American Council of Science Teachers. It merged with the American Science Teachers Association and reorganized in 1944 to form the present Association, and **The Science Teacher** became the Official Journal of the new National Science Teachers Association.

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Some Characteristics of Science Teachers

By FLETCHER WATSON

THIS session, concerned with the training of future science teachers, should be of interest to the American Association for the Advancement of Science for through the classes of these teachers will pass the potential scientists and engineers of the future and many of the general public. I wish to bring to your attention an important question which has received little consideration until now —what kinds of people become science teachers and, in particular, what values do they hold as important? Since we lack extensive case studies and test results, my comments can only be tentative inferences drawn from limited information and personal observation.

Male teachers predominate in science and mathematics, and as heads of families the economic position of these men is usually far from satisfactory. This has a direct bearing upon the number who exhibit their interest by joining organizations concerned with the teaching of science.

Over the nation somewhat more than 60,000 people teach some science between grades seven and twelve. While a membership census of the numerous teachers organizations is not available, a reasonable estimate of the number of individuals enrolled in the organizations can be made from the circulation of various journals generally included with such memberships. After allowance for library and duplicate subscriptions, I suspect that not more than 10,000 or one-sixth of the 60,000 teachers, belong to any science-teacher organization. A modest survey of 300 teachers [1] indicated that in New England such memberships were held by only one in every ten teachers. We might conclude that these organizations could readily double or triple their enrollments, but this I doubt.

One aspect of the difficulty was implied in the term "teach some science." Many people teach some science—in addition to classes concerned with other areas. This divides and dilutes the interests of the teacher who frequently ends up joining no organization. This unhappy condition arises in part from the small size of many schools in which a few teachers necessarily teach in several areas. But in part it also arises from administrative convenience complicated by scheduling. We are all too familiar with the administrative fiat by which a grossly unprepared teacher is assigned a science class with the assertion that "a teacher can teach anything" and "he had a course in biology in college 15 years ago." While many states have certification regulations based upon collegiate study at some earlier time, they are often ridiculously inadequate,[2] and even these can be flouted on the basis of administrative necessity whereupon the teacher has little or no redress.

That membership in such organizations may be a very poor criterion of interest is apparent on at least three accounts: many teachers have other employment on Saturdays [3] which prevents them from attending meetings and discourages member-

[1] F. G. Watson. *Harvard Education Review:* **19**, 147, 1949.

[2] G. G. Mallinson. *School Science and Mathematics:* **51**, 543, 1951.

[3] Adolph Unruh. *The Phi Delta Kappan:* **33**, 138, 1951.

Fletcher Watson, self-styled "retreaded astronomer" turned professional educator, is very much concerned about the quality of science teaching in our schools, elementary to college level included. He is concerned about the objectives of instruction and served as editor of the provocative book, *General Education in Science,* just published by the Harvard University Press.

He is concerned, too, about "who teaches science in our schools?" This article lets you in on his feelings about the question—feelings based on inquiries and on firsthand observations in schools throughout New England. May we venture the comment that the 50,000 science teachers who are *not* members of NSTA are perhaps the ones most in need of reading this article —but don't let that stop *you* from reading it.

Dr. Watson is associate professor in the Graduate School of Education, Harvard University.

ship; some feel that they cannot pay even the modest dues requested (although the school systems could easily pay such dues were they inclined to maintain the sharp cutting edge of their educational tools—the enthusiasm and knowledge of their teachers); but perhaps even more serious is the unprofitableness of most of the meetings. Here certainly sincere interest and assistance from instructors in liberal arts and teachers colleges could be helpful in improving the programs and the profitableness of the meetings.

Underlying these observable characteristics and more difficult to establish is what we may call the psychological set of these teachers. By this I mean their scales of values and their identification with some aspects of science or its teaching. Members of today's audience write articles, report research efforts, and talk to teacher groups. Yet we often feel that somehow we do not "get through" to the classroom operation of science courses. This is a major component of what is often called the "fifty year educational lag." Why is it that our best efforts produce so little results?

A suggested answer comes when we examine more closely the history of the training of ourselves and these people and the possible reasons why we and they have become teachers of science. A large fraction of secondary school teachers have studied at liberal arts colleges; for the northeastern states the commissioners of education tell me this runs to about 90 per cent. Now there is nothing inherently good or bad about such undergraduate training; but we must look at the scales of values impressed upon these students. Any person concentrating in the sciences takes a sizable number of sequential courses. These are generally oriented toward additional advanced study. Major emphasis is necessarily and, for the majority of students in the course, properly upon the advancement of science or technological application. It is not surprising, therefore, that these students assign high value to such technical knowledge. That is, they develop a strong identification with the subject matter area of *science*. Furthermore, they may have been impressed with the idea that a science teacher, unless he does research, is a traitor to the great cause of science.

A sizable proportion of those who end up as teachers probably originally hoped to find gainful employment in scientific or engineering work. Fluctuations in the general demand for such persons leave a varying number without positions. Yet since man must live, at least in part, by bread, they look for some position in which they can capitalize upon their special knowledges. Teaching is one such field. After a few years in the schools, tenure offers them some degree of economic stability, and most continue on as teachers. In fact, most are obliged to do so for their technical knowledge has tarnished since they were in school, and several new crops of competitors are now on the market. Unless these people become strongly concerned about *teaching*, they are likely to feel trapped and professionally frustrated resulting in a loss of their enthusiasm even for science.

Despite the fortunate fact that many do become interested and informed about the process of teaching, many others do not, and they constitute the lethargic group we attempt to stimulate.

Since they are employed as teachers, we might assume that they would automatically identify themselves with the schools and the problems of efficient instruction. Yet here I believe we are naive. These people originally chose to study science. Their training then emphasized the non-human aspects of the world. They have had little or no effective orientation toward the world of people and social events. The mental and social development of children are to them unknown areas and, like all of us, they hesitate to venture into the unknown for fear of revealing their ignorance. Furthermore, they were originally employed primarily because they had certain technical knowledges which were not common to the other teachers. Since each of us must maintain some hard core of self-respect, of "knowing what we know," to offset the slings and arrows of outrageous administrators, parents, and pupils, there is a natural tendency to take on that academic snobbery and social peck-order which asserts that "what I know is better, or more difficult, than what you know." This attitude does not expedite the inclusion of such teachers as equal working members of a school staff. Rather it provides rationalization for greater withdrawal from the school as a social institution, and results in courses increasingly crowded with abstract and abstruse technical information. The impact of scientific development upon general social thought and of technological development upon the course of history, both in the past and the present, are brushed aside for they are unknown to the teacher and therefore asserted to be unimportant to the pupils. Little wonder that our efforts are ineffectual to get teachers to consider community and world problems, to let pupils see that science is something more than merely the dissection of a worm's gullet. Our proposals and suggestions are rejected and lead to such responses as "improper" or "not real science," which means of course, "such ideas were not in the courses I took at college."

Our difficulties may be lessened if we can show teachers that science is one of the major social accomplishments of mankind and that the leading scientists have frequently been seriously concerned about the impact of their work both upon the philosophy of the times and upon technological development. This requires not necessarily more training, but certainly a different type of training. To lessen the teacher's idea of science as merely a body of technical information and to increase his realization that science is created by human beings may prove useful both to the individual and to his classroom operation.

While "looking over the shoulder of the scientist at work" may provide insight into the development of grand conceptual schemes, our future teachers also need experience with some of the "dirty work" of real science. I say real science in contrast to the usual textbook summaries (which in retrospect sound so simple and obvious) and the dull, routine, "fill in the right answer" laboratory efforts. The difficulties of actually seeing and analyzing an anomaly, of designing an experimental investigation, of manipulating the instrumentation, and of interpreting the results are frequently talked about but rarely experienced by our future teachers. Furthermore, they miss the exhilaration of actually creating some order from apparent chaos. An effective course with projects to which no one knows the answers would develop considerable sympathy for the actual scientist and create greater modesty in the future teacher.

Recognizing the natural tendency of the future teacher to emulate the last or best-liked instructor, we must be on our guard to teach him as we would have him teach. This is an especially serious point, for there appears to be a tendency in some of the teachers colleges, themselves struggling to gain academic prestige, to add to their staffs Ph.D.'s interested in erudite sciences and either hostile or at best neutral toward education.

The number of course credits in science acquired by a future teacher is a very dubious "criterion of ability." While we all want teachers to be comfortably at home in the various sciences—and I mean various, not just one or two—we must recognize that with some background and motivation they can read and learn after graduation. Unfortunately we frequently fail to instill this idea and "hardening of the cortex" sets in early. It is not the number of courses taken, but the operating ability that counts. Extensive technical study can be exceedingly useful, but it may ruin the teacher by strengthening his identification with the abstract subject matter of science and lessening that with the educational responsibilities of the school. Increased knowledge should provide the teacher with a wider selection of media through which he can guide the children's learning.

Inasmuch as most teachers teach three or four different science courses (in addition to almost anything else), to speak of "knowing their subject" is absurd unless the term "subject" means science as a whole, including its history, philosophy, and social impact. The artificial academic separation of the sciences appears immediately when any real problem is considered. The future teacher must initially obtain a competent working knowledge in the major areas of science and then conscientiously carry out a planned reading program.

My remarks contain no panacea, but you would not expect them to. The problems confronting us are many and serious; only sober thought, carefully planned investigation, honest differences of opinion presented in open discussion, and some vision of "what might be" will point to improvements. I have tried to point out that the science teacher is a human being and a special sort of one. Any efforts to reconstruct our training programs or to provide in-service training will, in my opinion, be successful only insofar as we consider the value systems currently held by these teachers.

What Is It?

For what goes behind the Iron Curtain see page 66.

The Need for Sex Education in the High School

By THOMAS H. KNEPP

Instruction in the anatomy and physiology of the human reproductive system, with a discussion of problems relative to sex, has been an important part of the biology course in our school ever since 1942.* During the past few years I have compiled some information which indicates that students have real needs for this type of instruction.

In our course we prepare for the work gradually. Throughout the school year, as occasion presents itself, terms such as egg, sperm, fertilization, ovary, oviduct, uterus, testes, penis, and breeding are used. Often I say that these terms will be discussed more fully later in the year. In this way students are conditioned for a study which could get out of hand from the first day.

During the first class session devoted to the study of the human reproductive system a questionnaire is presented to the students. The questions are designed to find out what these young people know—or do not know—about reproduction. The classes contain both boys and girls, the majority sophomores 15 to 16 years old. The students answer the questions and return their papers unsigned. No attempt is made to pry into their private affairs or to ask questions of a personal nature, yet the answers reveal a need for sex education under proper supervision.

After Kinsey's *Sexual Behavior in the Human Male* appeared I added a series of questions designed to elicit information concerning the pupils' backgrounds. A comprehensive study of these answers would be expected to show a correlation between sex knowledge and church affiliation, urban or rural background, schooling of parents, and parents' occupations.

A brief summary of these background answers reveals that we have a typical American group of students, probably not markedly different from that found in any other high school of our country. During one term, for example: (1) more than 50 per cent of the students were 15 years old with the 16-year group comprising about 24 per cent; (2) all students but one boy and one girl were members of the sophomore class; (3) these young people were affiliated with a variety of churches, mostly Protestant; (4) 59 per cent of the students lived in town; 38 per cent lived in rural areas; (5) most of their parents had a high school education. Parents of grade school achievement only ranked second, while parents who were college graduates were fewest in number; (6) there was great diversity among the occupations of parents, especially the fathers. More than 50 per cent of the mothers were housewives.

The portion of the questionnaire designed to find out what the students know about sex is illustrated by the following excerpts. Tabulated summaries of students' answers (and author's comments) follow each question. All numerical values given are percentages.

How, when, and where do the boys and girls in your school and community get their information about sex? In the Stroudsburg, Pennsylvania, High School all the tenth-graders in biology have a two-week unit study of sex and human reproduction—and Dr. Knepp, their biology teacher, tells about the need for it in this article and outlines some of the teaching procedures he employs.

But we can't help wonder whether this area of study isn't bigger than that—is it an end in itself or is it but one facet of personality development, human relationships, and preparation for marriage and parenthood? Wouldn't there be behavior patterns and mental, emotional, and physical health characteristics to be considered? Dr. Knepp doubtless answers many such questions, and perhaps he will help us by telling in a later article how his unit on sex and human reproduction grows into or out of these broader considerations.

* Knepp, Thomas H. "Sex Instruction in the High School." *Turtox News*, Vol. 25, No. 3, March 1947. Reprints available from the author. Send self-addressed, stamped envelope with request for copies.

QUESTION: How did you find out what you know about sex? (Check one or more answers.)

	Boys	Girls
Did your mother tell you?	19	81
Did your father tell you?	31	3
Did you learn from friends?	65	37
Did you "just pick it up"?	50	14

The answers to this question point the finger at parents, especially the fathers. Mothers seem to be doing a pretty good job of instructing their daughters, but the information is probably little more than the elementary facts concerning menstruation. Such failure on the part of parents results in a hodgepodge of information in the minds of their children. Since many parents do not have the correct information and lack a vocabulary of correct terms for the organs of reproduction and the physiological processes associated with it, it is small wonder that high school boys and girls know so few of the facts concerning human reproduction.

QUESTION: Did your parents provide you with books containing sex information?

	Boys	Girls
Yes	20	33
No	77	67

Many parents probably do not know that books of this type exist or where they may be secured.†

It might be pertinent to mention that *Letters to Jane* (J. B. Lippincott Company, 1948) is a book which every girl with a boy friend should read.

QUESTION: If you went to your family doctor, would you know what to call the parts of your reproductive system?

	Boys	Girls
Yes	50	32
No	48	67

How embarrassing such a situation must be to anyone, young person or adult, who cannot talk to a doctor about his or her reproductive system. Yet some people live a lifetime and know nothing but vulgar words for those organs which make the continuity of life possible.

QUESTION: How often do nocturnal emissions ("wet dreams") occur?

	Boys	Girls
Once a week	2	0
Once a month	19	24
Irregularly	73	46

† The author of this article has recently had published *The Human Reproductive System* by the William G. Brown Company, Dubuque, Iowa. Price, 60 cents. This booklet was written especially for high school students. (See review in *The Science Teacher*, Vol. XVIII, No. 2, March, 1951. *Editor*.)

From questions that have been asked of me, I am led to believe that girls are just as curious to know about this discharge in boys as boys are to know about menstruation in girls.

QUESTION: How old must a girl be before she can become a mother?

	Boys	Girls
6–10 years	0	0
11–15 years	65	76
16–25 years	33	25
26–50 years	2	0

It is unfortunate that one-third of the boys and one-quarter of the girls think that a girl must be 16 years old before she can become pregnant. Is ignorance on this matter one of the reasons why pregnancies occur in girls under 16 years of age?

QUESTION: How often does menstruation occur?

	Boys	Girls
Don't know	38	0
Every week	0	0
Every 28 days	54	100
Twice a year	2	0

QUESTION: How long does each menstrual period last?

	Boys	Girls
Don't know	46	3
One day	3	0
Five days	35	97
One month	6	0
One year	2	0

The last two questions show that girls have quite accurate knowledge concerning the rhythm of menstruation—as might be expected—but that boys are often quite hazy in their ideas about it.

QUESTION: Is it possible for a girl old enough to menstruate to become pregnant if she has sexual intercourse between her periods?

	Boys	Girls
Don't know	42	32
Yes	42	59
No	13	10

Since more than a third of the students do not know that the answer to this question is "yes," this may be another reason for pregnancies among high school students.

The questionnaire provides for students to write questions they may want to have answered. Here are some that have been asked. What causes nocturnal emissions? How do you know when you are pregnant? What is masturbation? Is it unhealthful?

Is it advisable for a couple to have sexual intercourse before marriage?

After the questionnaires have been collected we see the movie, *Human Reproduction,* produced by the McGraw Hill Company. This is an exceptionally fine film in which the female reproductive system, menstruation, the male reproductive system, nocturnal emissions, fertilization, pregnancy, and birth are presented in a manner that high school students can understand. Afterward the pupils are asked to state on unsigned papers what they thought of the picture. Here is one evaluation written by a 15-year old tenth-grade girl.

> In my opinion it was one of, if not the best, cleanest, and healthiest ways in which we teenagers can be informed of our duties to ourselves and to our children. . . . And I am sure that the parents of the future will be able to do their share in explaining to their children the parts and working of the human reproductive system. . . . It is too bad that some parents choose to keep their children in the dark on one of the most wonderful and important things in life.

During succeeding class periods we discuss both the anatomy and physiology of the male and female reproductive system, using the booklet I have written as a text. During the first few days of discussion the boys and girls meet in separate groups. This is done because it makes for greater ease and response if they are not mixed until after "the ice has been broken." Both boys and girls are shown Disney's movie, *The Story of Menstruation,* produced for International Cellucotton Products Company. Later when we study fertilization, pregnancy, and birth, boys and girls meet together without embarrassment and ask questions with ease.

The duration of class instruction may extend to two weeks. Then each student is again given an opportunity to write on an unsigned paper any questions he may still be thinking about or which he may have thought of during our class sessions. These I attempt to answer, with one exception—those dealing with contraceptives.

The questions are often astounding and indicate an honest desire for correct information. The queries can be placed in several rather distinct groups and show an interest in acts which probably affect many of the students directly or about which they have a natural curiosity. For example:

Birth. "Where (on the body) does a Caesarian operation take place?"
"How long does it take for a baby to be born?"

Opposite sex. "Do fellows get sexually excited more easily than girls?" "Do girls usually want to have sexual relationships?"

Faulty pre-natal development. "What causes Siamese twins? Can they be prevented?"

Menstruation. "Is there anything wrong when a young girl loses a *lot* of blood while menstruating?" "Why is it that you might go over the date on which your period is supposed to start?"

Petting. "Does a boy still respect you after mild petting?" "Is it perfectly normal for a girl to secrete a substance when she kisses a lot? Is it produced by getting a thrill and getting excited inside?"

Sexual relations. "Why do kids our age have sexual unions? Can it be stopped?"

Venereal diseases. "What does a venereal disease do to a person?" "Is there any way that you can tell whether you have syphilis and is there any cure?"

Marriage. "What is a good age to get married and have children so that you may grow up with them?"

Masturbation. "Does masturbation in the male have any bad psychological or physical effect?"

Do you agree that such questions deserve an honest answer? High school young people want to know about things which are important in *their* lives and which may have a tremendous bearing upon *their* future.

Recently one of our senior girls asked me to talk to the members of the Future Homemakers of America on problems of marriage and family life. I suggested that members of the group write questions they might like to have discussed. This gave me an opportunity to talk to them about things in which they were most interested. The girls had been students in my biology class as tenth-graders. Now, two years later, they asked questions which would not have been so pertinent during their sophomore year. Several were now "going steady," and they wanted to know more about themselves and their boy friends and their relationships with each other.

It is doubtful that many teenagers would ask their parents these questions. Both child and parent would probably be embarrassed. But school is different; it is clinical and impersonal, and therefore the questions come more easily. Moreover, to answer the questions requires a rather detailed knowledge of the anatomy and physiology of the human reproductive system and of the psychology of sex—knowledge that most parents do not have. In addition, most parents lack a vocabulary which would enable them to talk without embarrassment. The job, therefore, becomes one for the teacher.

What do high school students think about the need for sex education? Since they are the ones affected, their opinions should be of value in answering this question. One youngster wrote this typical comment.

> Everyone should know what things take place in the body. All, or at least most of us, are going to be fathers or mothers some day, and we should know what it is all about. If we do become fathers and mothers, our children will ask questions, and we must be ready to answer them.

To summarize—as my experiences indicate—it seems to me that:

1. Parents have not done an adequate job in instructing their children about sex. This is probably due to lack of information, insufficient vocabulary, or both.

2. High school students do not lack information concerning human reproduction, but much of the information they have is either faulty or completely false.

3. Students, if given the opportunity under impersonal clinical conditions, will ask earnest questions which they have been wondering about and to which they would like to have honest answers.

4. Students give excellent reasons why they should have the information provided by a course in sex education.

It has, therefore, become the duty of the school to provide sex education for all of its students, at such times and in such ways as are suited to the students' physical and mental development. To omit such instruction is robbing the children of one of the most important and fundamental parts of their education.

Instructional Materials For the Physical Sciences

By SAM S. BLANC

Hydraulics and Mechanics

A LOGICAL introduction to this area of interest might be to develop in the pupils an understanding of the basic concept of machines. Simple experiments demonstrating levers, planes, pulleys, and screws may be found in any good general science or physics textbook. Two filmstrips, *Simple Machines* (EBF)[1] and *Mechanical Movements* (VS), should be helpful in presenting the elementary concepts. Many very excellent motion pictures are also available as follows:

ABC of Hand Tools (two parts)	30 min., color, GM
How We Get Our Power	10 min., b & w, YAF
Force and Motion	10 min., b & w and color, CIF
Friction	10 min., b & w, YAF
Leverage	20 min., b & w, SOC
Machines Do Work	10 min., b & w, YAF
Simple Machines	10 min., b & w, EBF
Transfer of Power	20 min., b & w, MMA

[1] The code refers to the producers or distributors of the films listed at the end of the article.

The relation of depth to pressure may be demonstrated by means of two simple experiments. A tall, number five can, such as is used for fruit juices, should have the top cut out and three small holes punched along one side so that one is near the bottom, one in the middle, and one near the top. The can should be placed on a stand over a sink or large pan and should be filled with water. The pupils can see that the stream of water from the bottom hole is much stronger than the two from the other holes. This can be generalized to show that there is a definite relationship between the depth of the water and the strength of the stream. Another way of showing that pressure is related to depth is to mount a long-stemmed funnel in a ring stand and to connect a long rubber tube to the lower end. An aquarium or large battery jar should be filled with water. A short-stemmed funnel is connected to the other end of the rubber tube, and colored water is poured into the long-stemmed funnel so that it rises about half-way up the stem. The rubber tube should have a pinch-clamp on it to prevent the

Here is the second installment in Sam Blanc's review of instructional materials useful in the teaching of science. The initial article in the December issue dealt with areas of earth science. If you would like to have the series expanded, it is suggested that your drop a note to the editor or to the author and indicate the areas of your interest. Mr. Blanc teaches science in East High School, Denver, Colorado.

colored water from running out. The funnel at the free end of the tube is immersed in the jar, and the clamp on the tube is released. As the funnel is pushed down in the water, the water column in the stem of the other funnel will rise. It can be shown in this demonstration that regardless of the direction in which the open end of the funnel in the water is pointed the pressure is the same for any given depth.

The ten-minute motion picture, *Mechanics of Liquids* (CIF), shows how Pascal's Law of pressure on confined liquids is interpreted in terms of hydraulic machines and how Archimedes' principle of buoyancy is applied in terms of swimming. Two other films of value in clarifying concepts on this topic are *Harnessing Liquids* (SOC) and *Water Works for Us* (YAF), each ten-minutes in black and white. The principle of buoyancy may further be illustrated by filling two beakers with water and balancing them on a scales by dropping clean sand in one beaker until a point of equilibrium is reached. A means of catching the overflow water should be arranged, and a wooden block should then be lowered carefully into one beaker. It will be seen by the class that when the overflow water is removed, the two beakers are still in balance. They should be able to generalize the relationship between a floating object and its displacement of water.

The topic of mechanical engines offers a wide variety of teaching resources. Models of many types of vehicles, such as automobiles, ships, locomotives, and airplanes, may be assembled by the class to show practical applications. An interesting exhibit may be worked out by groups of pupils making simple dioramas showing how engines of various types are used by man. Pictorial materials for this study are abundant and are obtainable from a variety of sources. The principle of expanding steam as a source of power may be demonstrated by fitting a one-hole stopper in a flask with water. A glass tube is then bent at right angles, and one end is drawn out to form a tiny nozzle. The tube should be inserted in the stopper so that when the steam pressure builds up a jet of steam escapes through the nozzle. A rotor is made by cutting a dozen evenly spaced slits, an inch in length, around the circumference of a cut-out end of a tin can. These tabs should be turned at right angles to the lid to form vanes. A small hole should be punched in the center of the lid and a nail forced through as an axle. The rotor is mounted on brackets so that it revolves freely. When the jet of steam is directed on the vanes, the rotor begins to spin.

Since the mechanics of heat engines are quite complicated a number of the motion pictures listed should prove helpful to the pupils:

ABC of Auto Engines	20 min., color, GM
ABC of the Diesel Engine	20 min., color, GM
ABC of Internal Combustion	15 min., color, GM
Diesel: The Modern Power	20 min., b & w, GM
The Diesel Locomotive	10 min., b & w and color, ABP
The Steam Engine	10 min., b & w, YAF
The Steam Locomotive	10 min., b & w and color, ABP
Thermodynamics	10 min., b & w, EBF
Thermal Forces	20 min., color, HOC

The applications of the laws of mechanics and the use of mechanical engines is of great interest to most pupils when discussed in relation to aerodynamics and aviation. As an introductory activity a classroom exhibit of many different models and types of planes may be assembled by the class. Many pictures, charts, and posters are available from such airline companies as United, Pan American, and others. These may be used by a group of pupils to keep a current series of displays on the bulletin board. A field trip to an airport would make a valuable type of summary activity in this type of unit. Several interesting experiments to illustrate the properties of airfoils may be found in many good general science textbooks.

The main principles of aerodynamics are simply explained in the ten-minute motion picture, *Air in Action* (CIF). This film shows wind tunnel tests and airplanes in flight. Animated drawings are used to explain the principles and applications of moving air streams. *Airplanes and How They Fly* (YAF), ten minutes in black and white, presents an elementary discussion of the principles of aircraft flights and illustrates for the pupils a number of different types of planes. The ten-minute film, *Problems of Flight* (EBF), clearly shows the manipulation of a plane's control surfaces. Animated drawings are superimposed over natural photography to give an explanation of forces acting on a plane during flight. A 40-frame filmstrip, *History of Aviation* (VS), presents an elementary treatment of milestones in

aviation. Other motion pictures which should prove useful in stimulating interest in this area are as follows:

America's New Airpower	15 min., b & w, MOT
The Banshee	15 min., b & w, WES
Faster than Sound	10 min., b & w, BIS
Jet Getaway	10 min., b & w, BIS
Jet Propulsion	20 min., color, GE
Theory of Flight	10 min., b & w, EBF
Turbo-Jet Propulsion	15 min., b & w, BIS

Electricity and Magnetism

Electricity and its applications offer a wide variety of experiences for pupils. Many pictures are available for bulletin board displays from such commercial sources as Westinghouse, General Electric, and others. A field trip to an electrical generating plant will leave a profound impression on the pupils of the powerful forces involved in the production of this form of energy. An excellent motion picture to use in introducing this unit would be the ten-minute film, *Introduction to Electricity* (CIF), in which the pupils are acquainted with the meaning of static electricity, electric currents, and magnetic lines of force.

It is well to emphasize the safety aspects in handling electrical devices. A graphic illustration of why fuses are used may be shown by mounting two bolts, an inch apart, on a small wood base. A piece of fuse wire of one ampere capacity, or a single strand of fine copper wire, should be connected across the two bolts. The two bolts are connected in series with a line going to one side of a mounted socket. The other end of the wires is equipped with a plug so that the mock-up may be connected to an electrical outlet. This fuse should allow a 100-watt bulb to operate successfully. However, if an electric toaster or iron is plugged into the socket, the fuse will "blow" with a spectacular flash. From this demonstration pupils should be led to generalize about the load capacity of fuses and wiring. Charts may be made to show the correct uses of fuses and the capacities needed for various electrical appliances.

The study of electricity would not be complete without giving the pupils an opportunity to build individual working models of electric motors. Many different ways of doing this interesting experiment are possible. It is suggested that elementary texts in physics or electricity be consulted for specific directions and lists of materials needed. If all materials for a complete model are assembled in a box, so that each pupil or team of pupils has everything needed at hand, the project will procede with dispatch. Directions should be carefully discussed, and hints, where needed, should be offered by the teacher as the activity is carried on.

Many very fine motion pictures and filmstrips are available in this field to help pupils understand a number of concepts which are not easily demonstrated for a beginning class:

Electrodynamics	10 min., b & w, EBF
Electricity	41 frames, b & w, YAF
Elements of Electrical Circuits	10 min., b & w, EBF
Elements of Electrical Circuits	40 frames, b & w, EBF
Flow of Electricity	10 min., b & w, YAF
Making Electricity	10 min., b & w, EBF
Measurement of Electricity	10 min., b & w and color, CIF
Principle of the Generator	10 min., b & w, YAF
Series and Parallel Circuits	10 min., b & w, EBF
Story of the Storage Battery	30 min., b & w, USM
What is Electricity?	20 min., b & w, WES

Many concepts of magnetism may be easily illustrated by means of the standard experiments described in any good general science or physics textbook. Attraction, repulsion, and fields of force may all be demonstrated by the use of permanent magnets. The action of an electromagnet may be graphically illustrated by making an "electromagnetic gun." Through an eight-inch piece of round wood, such as a broom handle, a quarter-inch hole is drilled the length of the wood. Any rough places in this bore should be smoothed with a rat-tail file. Wind about two layers of #10 or #12 enameled magnet wire on this spool and allow several inches of free wire to remain at each end for making connections with a source of electricity. A 60-penny spike with the head cut off, or any other soft iron rod about six inches long of the proper thickness, is smoothed with a piece of emery cloth. The coil is connected through a pushbutton to a six-volt storage battery. The "gun" is held in a horizontal position with the "muzzle" pointing at a wall and the iron rod is inserted in the bore somewhat less than halfway (it is wise to experiment beforehand so that the correct end of the bore is used in the demonstration). The button is pushed momentarily so that the coil is energized for a short interval. The momentum of the magnetic field should propel the iron rod some distance from the "gun." This demonstration may be used to stimulate pupils to further investigation of the properties and actions of electromagnetic devices.

Several motion pictures and filmstrips may be used to increase pupil understanding of this topic:

Electromagnets	10 min., b & w, YAF
Magnetism	10 min., b & w and color, CIF
Magnetism	41 frames, b & w, GE
Magnets	10 min., b & w, YAF
Magnets	46 frames, b & w, YAF

The related areas of radio, radar, and television are rather complicated topics for most beginning pupils. Some may have enough interest in the topic to try to make simple radio receiving sets. A text on fundamentals of radio will explain the details of such a construction adequately. However, it is again suggested that all necessary parts are assembled into a "kit" beforehand so that the pupils will have everything they need at hand. Step-by-step directions may have to be prepared for the vocabulary level of the class in which this experiment is being carried on. And the teacher must be a constant source of help and encouragement during the actual construction.

Many of the learnings in this area, however, will have to come from the use of pictorial and graphic materials. A number of commercial sources will be happy to supply posters, pictures, and charts which may be studied individually, or displayed as a bulletin board exhibit. Perhaps a field trip to a broadcasting station would help pupils gain an understanding of some of the applications of the work they have studied. Many good motion pictures and filmstrips are obtainable which should be of value in helping the pupils gain some additional understanding of electronic devices:

Behind Your Radio Dial	20 min., b & w, MTP
Electronics at Work	20 min., b & w, WES
How Television Works	49 frames, color, PSP
In all Weather	30 min., b & w, BIS
Magic in the Air	10 min., b & w, GM
Modern Aladdin's Lamp	20 min., b & w, WEL
Naturally It's FM	20 min., color, GE
Sightseeing at Home	15 min., b & w, GE

Producers of Motion Pictures and Filmstrips

ABP—Arthur Barr Productions, 6211 Arroyo Glen, Los Angeles, California

BIS—British Information Services, 30 Rockefeller Plaza, New York City

CIF—Coronet Instructional Films, 5 East South Water Street, Chicago

EBF—Encyclopaedia Britannica Films, 1150 Wilmette Avenue, Wilmette, Illinois

GE—General Electric Company, Advertising and Sales Promotion, 1 River Road, Schenectady, New York

GM—General Motors Corporation, Film Distribution Section, 3044 West Grand Boulevard, Detroit, Michigan

HOC—Humble Oil and Refining Company, Film Library, P. O. Box 2180, Houston, Texas

MMA—Museum of Modern Art Film Library, 11 West 53rd Street, New York City

MOT—March of Time Forum Films, 369 Lexington Avenue, New York City

MTP—Modern Talking Picture Service, 30 Rockefeller Plaza, New York City

PSP—Popular Science Publishing Company, Audio-Visual Division, 353 Fourth Avenue, New York City

SOC—Shell Oil Company, 50 West 50th Street, New York City

USM—United States Bureau of Mines, Graphic Services Section, 4800 Forbes Street, Pittsburgh, Pennsylvania

VS—Visual Sciences, Suffern, New York

WEL—Western Electric Company, Motion Pictures Bureau, 195 Broadway, New York City

WES—Westinghouse Electric Corporation, School Service, 306 Fourth Avenue, Pittsburgh, Pennsylvania

YAF—Young America Films, 18 East 41st Street, New York City

What Is It?

(From page 59)

Soft winds carry experimental Crusade for Freedom balloons aloft in a test run at Minneapolis, Minnesota. These experimental flights were forerunners of the almost nightly launchings in Western Germany when the Crusade for Freedom sent millions of messages into the Iron Curtain countries.

The balloons are called pillows because they resemble fat overstuffed pillows when inflated and carried along by winds 20,000 feet up. Balloons sent from Germany bore five-inch letters spelling "freedom" in the Iron Curtain languages and contained messages supplementing Radio Free Europe's work.

"The total of the common sense of the people is the greatest and soundest force on earth."

—*Thomas Jefferson*

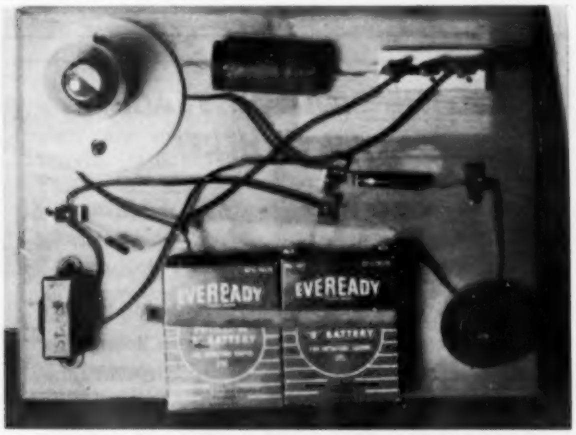
Simple Apparatus for Demonstrating

Chokes and Condensers

By JAMES E. CREIGHTON

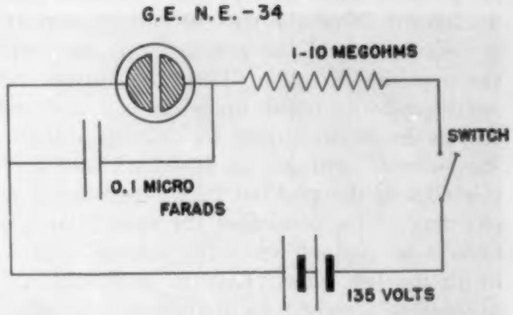
School of Education, Boston University
Boston, Massachusetts

The difficult problem of demonstrating and explaining the workings of electrical condensers and choke coils can be solved simply and inexpensively. Most science teachers are aware of the difficulty high school students have in grasping the illusive concepts of self inductance of choke coils and the charging and discharging of electrical condensers. The following paragraphs show how the science teacher can make three simple "breadboard" circuits which will be of immense value as visual aids in teaching these principles. By using a neon lamp as sort of an indicator of what is happening in such circuits, the student can readily "see" the elasticity of condensers and the momentum effect of self induction upon current.



Figures 1, 2, and 3 show schematically a neon lamp being used with a choke and condenser to make simple D. C. demonstration apparatus. Figure 1 is a simple relaxation oscillator circuit similar to that used in the sweep circuits of cathode-ray oscilloscopes and certain time-delay tubes. The high resistance in series with the neon lamp keeps the voltage across the lamp below its normal starting voltage of 85 volts. However, as the current leaks through this resistance, it gradually charges the condenser to a voltage high enough (85 volts) to light the lamp. The condenser then immediately discharges through the lamp causing it to flash on

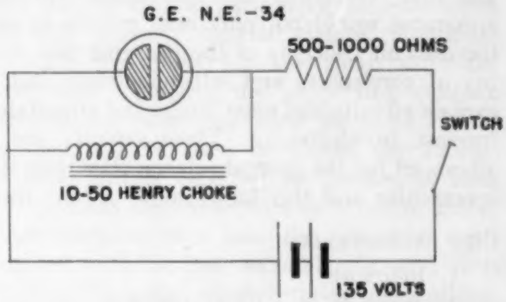
FIG. 1



momentarily. As soon as the voltage on the condenser drops below the sustaining voltage of the lamp (about 65 volts) due to the discharge of the condenser, the lamp goes out. The condenser immediately begins to charge up again and repeats its discharge through the lamp, thus causing a continuous flashing on and off of the lamp at a frequency dependent upon the size of the resistance and capacitance of the circuit.

Figure 2 is the same circuit as in figure 1 with a choke substituted for the condenser and a much smaller resistance in series. When a steady current flows, the lamp is dark, because the low-resistance choke coil bypasses most of the current. But, when-

FIG. 2

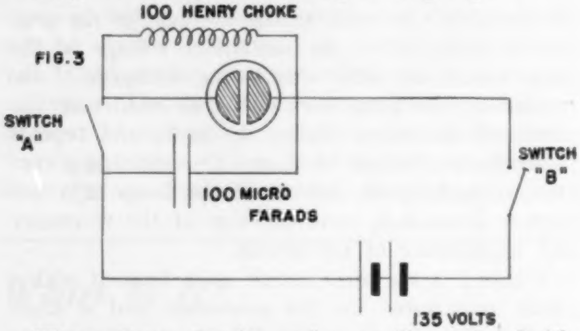


ever this current is started or stopped, the lamp glows. Current cannot begin to flow or stop suddenly in a choke coil because of its large self inductance. Therefore, at the moment the switch is closed most of the current flows through the lamp. Then, again, when the switch is opened, the current tends

to continue in the coil and necessarily finds its way through the lamp again. Note: opposite sides of the lamp glow.

Figure 3 makes use of both condenser and choke thus producing an oscillation which gradually damps out. The condenser after being charged is allowed to discharge by means of switch "A" through the lamp and choke. But, owing to the coil's self induction, the current cannot build up to its full amplitude at once; it gradually builds up (like a mass getting into motion) and reaches its greatest value just as the condenser plates are discharged. Now the current cannot stop at once; it continues, and the condenser is charged up in the opposite direction. Then the current reverses, again gradually builds up in the coil, and recharges the condenser to almost its original voltage. Thus the current continues to flow back and forth, but is gradually damped out by the resistance. At each charging of the condenser the neon lamp glows. It flickers on and off until the voltage falls too low to excite the glow. This is obviously an exact analogy to a weight oscillating on a spring.

FIG. 3



These three circuits make excellent visual-aids for general science and high school physics because of their inexpensiveness, simplicity of construction, and their versatility and spectacular nature. This apparatus would not only help greatly in teaching the difficult concepts of the charging and discharging of condensers and self-inductance, but it can explain circuits and neon lamps and stimulate much interest in electricity. These circuits are rather advanced for the general science class, but they are spectacular and this factor alone merits their use.

LIST OF MATERIALS:

1. Bell wire.
2. Two 67½ v. "B" batteries.
3. Neon lamp. General Electric (NE. 34) excitation volts, 80; sustaining volts, 60.
4. Several resistances (1-10 megohms; 2 watts).
5. Several condensers (.5, 1, 1.5 mocrofarads).
6. One condenser (about 100 mfds.).
   Caution: do not use polarized condensers in the circuit of figure 3 because the condenser charges in both directions.
7. One 100-henry choke.
8. One 10-to-50-henry filter choke. (The above 100-henry choke can be used in place of the 10-to-50-henry choke in figure 2.)
9. Several switches.
10. One 500-1000-ohm resistance, 2 watts.

THINGS TO DO:

1. Try different sized resistances in circuit 1.
2. Try different sized condensers in circuit in figure 1.
3. Remove high resistance in circuit in figure 1 and observe.
4. Remove high resistance and complete circuit by having class join hands.
5. Reverse leads of battery and observe lamp in figure 1.
6. Remove choke from circuit of figure 2 and observe.
7. Observe which side of lamp flashes on when the circuit is turned on, when it is turned off in figure 2.
8. Try placing some resistance in series with the choke in figure 3.
9. Observe which side of the lamp flashes in circuit in figure 3. Is this different from what happens in circuit 1? Why?

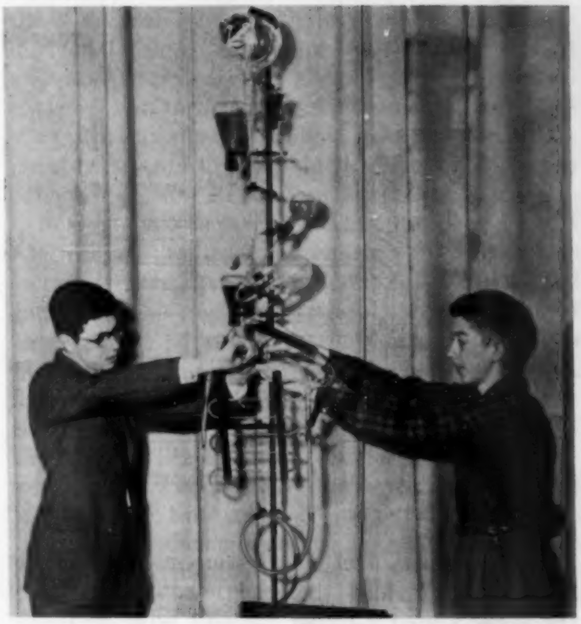
A Transparent Working Model of the Human Digestive System

By HOLLIS FRAMPTON and TOM REED

THE AUTHORS spent about 40 dollars and their study periods and many hours after school in building and rebuilding the model shown in the accompanying picture. A complex gas-operation mechanism, designed to operate on compressed air or carbon dioxide was found to be inefficient, fragile, and difficult to operate and was discarded to be replaced by blowing the various solutions into the main fluid column by mouth. With the accompanying picture or the diagram two students could in all probability construct the model in 10 to 15 hours.

To avoid unnecessary work with glass, Tygon flexible plastic tubing was used. Where tube clamps are used, it is best to use rubber tubing. The entire model was fastened to a six foot, three-eighth-inch steel rod, and the various parts were secured to this support with ordinary burette clamps. A special wooden rack was built for the small intestine. After the final assembly the supporting column, base, and clamps were enameled jet black. Mohr burette clamps were used to clamp the tubing.

It is important to have an air intake for each piece of appartus that represents an organ or gland. All rubber stoppers must have the protective coating removed with carbon tetrachloride, and it is helpful to apply a film of glycerin to glass tubing, especially before insertion into the plastic tubes. It is absolutely imperative that the ends of all glass tubes be firepolished. The ingenious student can probably add numerous small innovations that will improve the operation of the model. The size of the liquid containers depends upon the number of demonstrations desired without refilling.

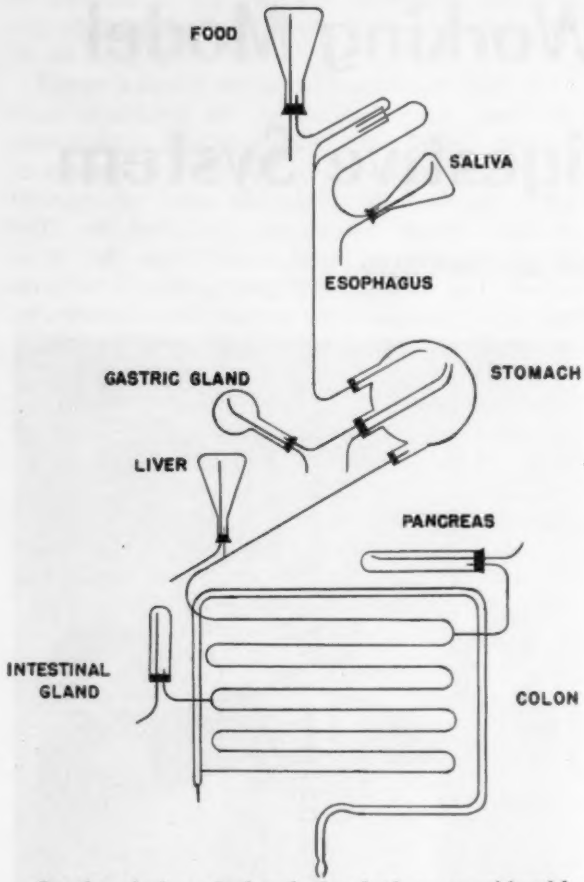


Tom Reed, left, and Hollis Frampton, right, with their model of the human digestive system.

Hollis Frampton and Tom Reed are the youngest authors to hit the pages of this journal. They are ninth-grade students in the Wilbur Wright Junior High School, Cleveland, Ohio. Their teacher, William E. Niehaus, says he helped them a bit in getting started and then stayed out of their way. "I did not contribute to this project," he adds, "therefore, all the credit should go to the two boys." The model was demonstrated at the 1951 convention of the Central Association of Science and Mathematics Teachers at Cleveland.

We're glad to make *The Science Teacher* space available for such articles. But wouldn't it be nice to have *The Science Student* for reporting on student projects, junior research, and many other kinds of items of interest to science-minded boys and girls? Another question—in such boys as these do we have a couple of gadgeteers or two future scientists or engineers? How can we get a reliable estimate of the science potential of boys and girls early enough to do something about it guidance-wise?

Your experience and suggestions along these lines are earnestly solicited. Write to Keith Johnson, chairman, Committee on Awards, c/o NSTA, 1201 Sixteenth Street, N.W., Washington 6, D. C.



In the choice of chemical solutions considerable latitude is provided the experimenter. Originally the authors used a rather complex series of chemical changes, but the making of the solutions consumed too much time, and results were not always the best, so the plan was considerably simplified. The present solutions consist primarily of vegetable dyes. This has reduced the cost of operation to less than three cents per demonstration and has decreased the working time of making the solutions. The solutions now used are:

FOOD MIXTURE: water—400 ml.
sodium carbonate—5 grams
green vegetable dye—.2 ml.

SALIVA: ethyl alcohol—40 ml.
phenolphthalein—1 gram violet dye—.1 CC.

GASTRIC JUICE: water—180 ml.
acetic acid, glacial—20 ml.
yellow dye—2.5 ml.

The final three solutions (bile, pancreatic juice, intestinal juice) are merely solutions of green, blue, and orange dyes in water. The color intensity in all but the "food" and "saliva" solutions should be relatively high. As a test put the solution into a three-sixteenth-inch glass tube; if the color appears bright from a distance of 10 feet, the solution is suitable, if not, add more dye.

Some 30 or 40 demonstrations can be made with the model before it needs to be cleaned. Pouring clear water through it will generally do the job; if not, use a strong solution of sodium carbonate.

Meetings and Conferences

. . . of interest to science teachers

A conference on Earth Science Education will be held at the Choate School, Wallingford, Connecticut, on Saturday, March 15. The third such conference in New England in successive years, this one will provide special opportunity for teachers of earth science in secondary schools to describe their courses and discuss their problems. The viewpoints of school superintendents will be set forth, and the problems of teacher education in earth science will be presented by officers of teachers colleges. For further information, consult Professor C. R. Longwell, department of geology, Yale University, New Haven, Connecticut.

Next meeting of the New Jersey Science Teachers Association will be at Frick Chemical Laboratory, Princeton University, on Saturday, March 15. General session that morning will include a presentation of simple teaching demonstrations in biological science by Dr. Paul Brandwein of Forest Hills, New York, High School, a "drama" by Dr. Louis C. Jordy of Drew University titled "Water Is All Wet," and a tour of the campus. Afternoon sessions will offer equally attractive programs for biology and general science, the physical sciences, and for science at the elementary school level.

A conference on nuclear energy has been scheduled for May 20 and 21 at Michigan State College, East Lansing. Although geared heavily to the scientific and technical aspects of the subject, advance program information indicates numerous items that will doubtless be of interest and value to science teachers and especially to all who are concerned with the education of teachers in science. Emphasis is to be placed upon the uses of nuclear energy in industry and for power generation. Cooperating groups include the Argonne National Laboratories, the U.S.A.E.C. Reactor Division, and the Detroit Edison and Dow Chemical companies. For further information contact Dr. D. J. Renwick, conference program chairman, mechanical engineering department, Michigan State College.

PRECIPITATES

Announcements, News, and Views of Current Interest

FLASH! As of writing, 15 companies have arranged for display space at the NSTA summer conference at the University of Michigan, June 26-28. This will be NSTA's first commercial exhibit from textbook publishers, manufacturers of apparatus and equipment, and business and industrial organizations—another "added attraction" for the Ann Arbor meeting.

ONE OF THE highlights of the Health Science Section at the Philadelphia meeting of NSTA was the showing of the film, *From One Cell.* This is a 14½-minute color film on cell growth for biology students. Not until the film is about three-quarters through does it come out that it is a "cancer film." The picture brings the complex subject of embryonic, regenerative, and degenerative cell behavior to life in a most effective manner. Produced by the American Cancer Society, the film may be obtained for school use through any of its 61 divisions maintained in every state, Alaska, and Puerto Rico. Note that the film is designed strictly for *classroom* use; it is not recommended for general school assemblies.

IF YOU'RE INTERESTED in teaching devices in electricity and electronics, you'll want to examine literature on the S. H. Dumville products. Address: 2500 Wisconsin Avenue, N. W., Washington 7, D. C. Several different assembly kits available at prices ranging from $10 upward.

STERLING FILMS, INC. has announced "Louis Pasteur—Man of Science" in a three-reel version (27½ minutes) at $100. No rental plan indicated. Filmed at places where Pasteur actually lived and worked, the film is narrated by Hollywooder John Carradine. Address Bernice Coe, educational director, 316 West 57th St., New York City 19.

FROM WARD'S Natural Science Establishment, 3000 Ridge Road, Rochester 9, New York, comes this request. "We are in immediate need of a quantity of catlinite or pipestone, a dense indurated clay or shale, formerly quarried in a small way in Pipestone and Rock counties in southwestern Minnesota. As the former localities are now closed to quarry operations, we are sending this letter in hopes that one of our readers may have duplicate material which he would be willing to send us on a cash or an exchange basis. Pieces of catlinite 3 x 3 x 5 inches are preferred but thinner pieces would also be useful."

AN INTERESTING prospectus of a science work camp for young people of high school age to be launched this coming summer has reached us. In addition to field work in geology, meteorology, biology, and other areas, there will be opportunity for students to do group study of the ecology of a small area of our earth, its resources, and their interrelationship. Experiences in community living and work experience on a dairy farm will be included. For further information and a list of advisors (practically all of whom happen to be NSTA members), write to Mrs. Martha Munzer, Fieldston School, Fieldston Road, New York City 71.

FOR THOSE who saw and heard Professor Hubert Alyea at our Philadelphia meeting and wanted his lecture written up in THE SCIENCE TEACHER (and for those who missed this treat), send him a post card request addressed to the Chemistry Department, Princeton University, Princeton, New Jersey, and he'll send you a reprint of one or two articles he has already done on the subject. Already reported in the pages of *The Science Counselor* (Duquesne University) and *The New Jersey Science Teacher,* there is no point in once more writing out his suggestions on chemistry demonstrations, he feels. Agreed, if he can give us reprints of same!

FIRST ANNUAL REPORT of the National Science Foundation is now available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25; price, 20 cents. Quoting from the Foreword by James B. Conant, chairman of the National Science Board: ". . . if the aims of Congress as set forth in the National Science Foundation Act are to be fulfilled, there must be all over the United States intensive effort to discover latent scientific talent and provide for its adequate development." Interesting case histories in electronics, biology, and medicine are given to illustrate the nature of basic research and the gamble and investment involved.

The Sugar Molecule, a publication of the Sugar Research Foundation, Inc., 52 Wall Street, New York City 5, carries many articles and items of interest to science teachers especially in chemistry and biology. The current issue, for example, includes discussions of fluoridation and dental caries, soils and health, anu artificial feeding. *Perhaps* (we're not certain) a post card request will get you on the mailing list.

Demonstration of Electrical Devices

The Slow Learner Wants To See It Work

By MORTON L. NEWMAN
Science Instructor
William E. Grady Vocational High School, Brooklyn, New York

In addition to their difficulty with words and numbers, slow learners may find it virtually impossible to form clear concepts of abstractions, including electromagnetism. They may, however, have the ability to appreciate, on an elementary level, how a device works.

To reach his pupils, the teacher of the slow learner must have recourse to every form of visual aid—charts, slides, movies, the device itself, etc. Yet many of these aids seem also to be essentially verbal or pictorial *descriptions* and not demonstrations of the actual operation. Even the use of the device itself may force the teacher to depend too much on words, for often the device is far too small or its motions much too rapid to be seen clearly by the class.

Below are descriptions of specially built supplements to the usual visual aids, designed to reach the slow-learner. The apparatus in each case has been made as large and as slow-moving as possible, and wherever feasible the flow of current is indicated by the lighting of a bulb in the circuit.

1. TELEGRAPH (Fig. 1). This is merely a greatly enlarged model with a bulb in series with the coil.

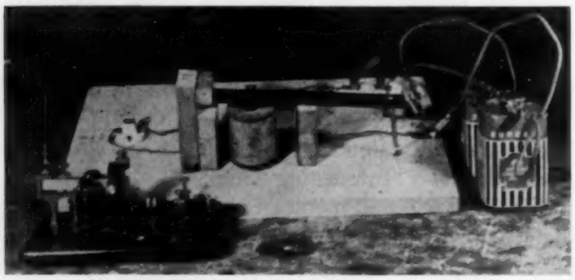


Figure 1. Enlarged model of the telegraph

2. RELAY. This is a modification of the above model of the telegraph. A strip of copper is placed on the lower armature stop to serve as a contact point when the armature moves down. Two bulbs, a dim light in the coil circuit, and a brighter light in the relay circuit, serve to demonstrate the uses of a relay.

3. BUZZER OR BELL (Fig. 2). Again, this is merely a very much enlarged model. The spring is a brass strip riveted to a small iron armature. The bulb, in series with the coil, flickers on and off as the armature moves slowly. The operation may be performed manually to slow it down to the word-production rate of the teacher or a pupil.

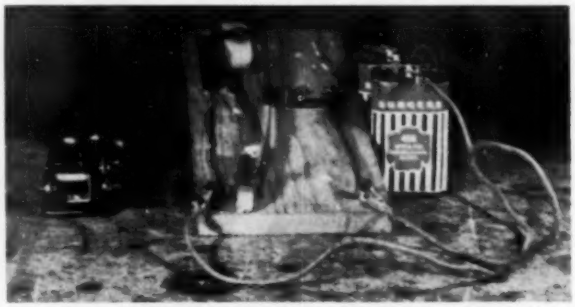


Figure 2. Enlarged and slow-moving model of a bell.

4. INDUCTION COIL (Fig. 3). The principle that current flows in the secondary only on the make or break of the primary circuit is usually difficult to establish without much verbalizing. However, a few minor adaptations of the apparatus may simplify matters. Adjust the points so that they stay closed whenever the primary current is on. Also, connect a small bulb in the primary circuit. To the secondary terminals connect a neon glow lamp. When the switch in the primary is closed, the neon lamp in the secondary glows only momentarily,

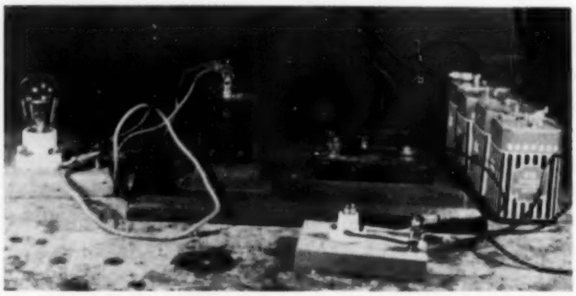


Figure 3. Induction coil connected to a neon glow lamp.

while the small bulb stays lighted. When the switch is opened, the small bulb goes out, but the neon lamp again glows momentarily.

It is even possible to point out the changing direction of the current in the secondary, since alternate plates in the glow lamp flash on and off with the make or break of the primary circuit.

5. MOTOR (Fig. 4). This model was constructed with the purpose of indicating the changing polarity of the armature by means of illuminated letters "N" and "S."

Only one of the brushes (made of strips of brass) is actually connected to the batteries; the other is "dead." The commutator is built of two copper strips mounted on a piece of round wood about one inch wide and two inches in diameter. Each segment of the commutator is wired separately to one

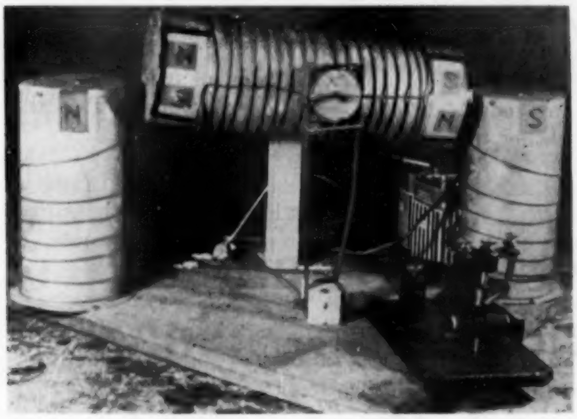


Figure 4. Model of a motor.

of the two parts of the armature coil. The armature coil looks like one continuous winding, but it is actually in two independent parts.

Inside the hollow armature (metal or cardboard cylinder) there are two sets of two light bulbs. Each set is wired in parallel through one part of the armature winding to one of the segments of the commutator (see figures 5 and 6).

The metal armature and the one-quarter-inch shaft serve as the common ground. Windows are cut out of the armature so that the bulbs illuminate the appropriate "N" or "S" labels.

As the armature is made to revolve, the "N" and "S" on opposite sides glow. At the proper moment, when the armature poles are closest to the field coils, the live brush makes contact with the other segment of the commutator. The other set of two lights goes on, indicating the change in polarity.

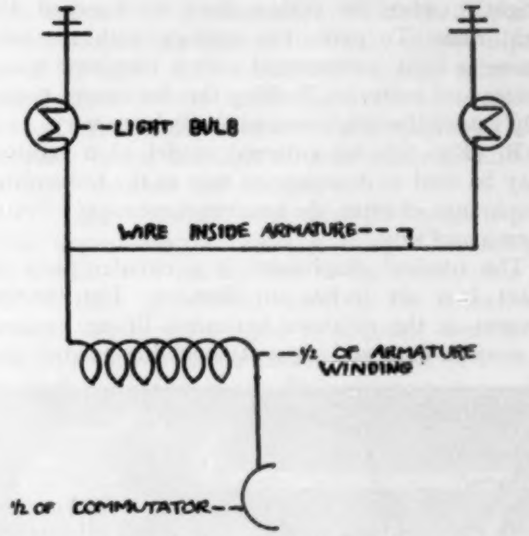


Figure 5. One half of the wiring for the model of a motor.

The actual rotation is done manually. (In one model the armature was driven by an induction motor geared down to six rpm.)

The field magnets are similarly made of hollow metal cylinders, each with a single light behind a window.

The light-bulb sockets were mounted on the circular caps on the ends of the armature and the field magnets.

6. TELEPHONE. A. (Fig. 7). A carbon-disc rheostat may be used to demonstrate the operation of the carbon box in the transmitter. As the carbon discs are tightened, the light in series glows

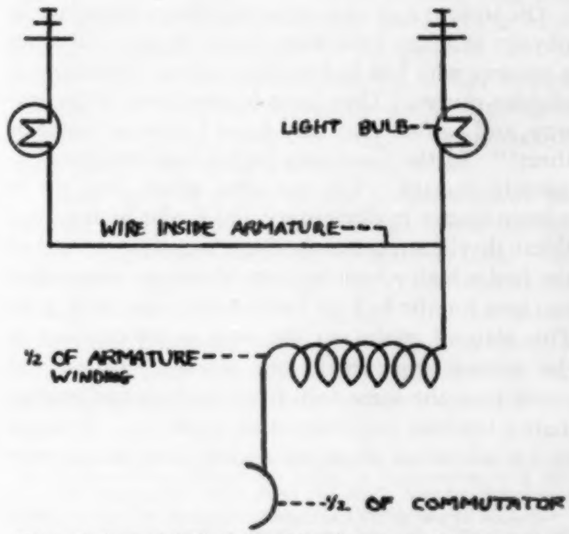


Figure 6. Second half of the wiring for the model of a motor.

brightly; when the carbon discs are loosened, the light dims. To make the analogy with the telephone, a light is connected with a telephone transmitter and batteries. Pushing the diaphragm manually causes the brightness of the light to vary.

B. (Fig. 8). An enlarged model of a receiver may be used to demonstrate that as the transmitter diaphragm vibrates, the receiver diaphragm vibrates correspondingly.

The receiver diaphragm is a circular piece of sheet iron six inches in diameter. The electromagnet is the common horseshoe lifting magnet. A wooden base and supports hold the magnet and

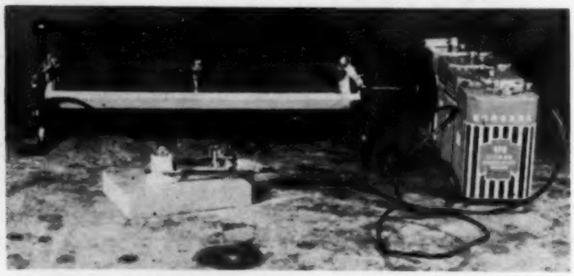


Figure 7. Carbon-disc rheostat connected to light bulb.

Figure 8. Model of a telephone receiver connected to a telephone transmitter.

the diaphragm. As the transmitter diaphragm is moved manually, the light bulb glows, and the receiver diaphragm is attracted toward the electromagnet.

These visual aids were not intended to preclude the use of any of the other teaching aids customarily found in the science classroom. They were devised particularly to assist in the teaching of the slow learner. However, the idea of using large and slow-moving models might also be of help to the teacher of normal or bright groups.

Better Relations Between Secondary and Elementary Teachers in Science

—A Committee Report*

ON MORE THAN one occasion college chemistry or physics teachers have been heard to say, "Give me a student who has had no high school chemistry or physics course. They have learned very little anyway, and half of what they know I have to 'unteach' them!" In the same vein high school teachers frequently remark, "I've no idea what they do in science classes in elementary and junior high school. What they learn certainly doesn't carry over." And the junior high school teachers blame the elementary teachers for the lack of background, and so it goes. This state of affairs, by the way, is not confined to the science sequence in our schools. Listen and you'll hear the same talk from English and mathematics teachers and from other areas too. It ought to jolt all of us when we realize that people who employ our graduates often say "I teach my new employees from the ground up. Their school training seems to lack the essentials for competent work!"

The day may come when all of us stop blaming the previous training and decide that the teacher's job, in any one year, is to take the pupils a year's worth farther on the road toward attaining the objectives of education. In the case of science—to understand and to use scientific generalizations and principles in solving problems, to grow in ability to solve problems, to be more scientific in attitude, and to develop a greater appreciation of, and interest in, the environment. We must realize that no group of eighth-graders will ever graduate to the next level with each member "up to standard" in all of these respects. Some will be above; some below, for many reasons which we will not delve into here.

Recognizing this situation for what it is, it seems important that teachers at all levels understand the

*A report of the NSTA Committee on Elementary Science. Names of the committee members appear at the conclusion of the article.

meaning of the total over-all objectives and attempt to make as much progress as possible in attaining them at their grade level. It is likewise important that all of us, as teachers, realize that it is important for us to know what experiences pupils have had *before* they come to us and what will be expected of them *after* they leave us and see how our year of work fits into this total pattern.

If possible, it is often extremely helpful for teachers of various levels of instruction to observe each other's classes. Seeing children of various grade levels at work helps give a clearer picture of the objectives, kinds of experiences, and ways of working throughout the school years. Supervisors in the various levels can often assist teachers gain such a picture through making such observations possible, by sponsoring teachers meetings, curriculum planning periods, and demonstration lessons.

It has long been the concern of NSTA to stimulate more elementary teachers to join the association (or to receive membership services through their school's subscription) and to participate in its activities. Science is but one of the many areas of concern to teachers in the elementary school, but a large number of these teachers recognize it as an important one. They need help in developing a background in science and in learning how to teach it. Many secondary science teachers have successfully assisted these teachers with their problems of science teaching to the mutual benefit of both and certainly to the increased science educational opportunities for the pupils at all levels.

This mutual assistance has come about in many ways. Secondary teachers have helped to supply simple apparatus for use in the elementary school. They have acted as consultants to elementary pupils who have special interest and talents in science when the elementary teacher felt inadequate to help. Some of their outstanding pupils have acted as helpers to elementary teachers and in this way developed an interest in becoming future science teachers. Secondary teachers have helped elementary teachers find information, order supplies, and find audio-visual aids. They have visited some of the classes in elementary schools and have become acquainted with some of the problems of science teaching at this level. They have become acquainted with how teaching and learning go on with young children. On the other hand, through this plan of mutual assistance elementary teachers have learned some of the problems which their pupils must face in their later education and have become more skillful in helping young pupils to better equip themselves.

It is this kind of relationship which the Committee on Elementary Science of NSTA wishes to promote. It urges that secondary teachers who are members of NSTA make some initial overtures toward establishing a closer relationship with elementary school teachers through whatever administrative channels are necessary.

We suggest the following types of things as possible approaches to closer working relationships. In almost every packet sent to the membership of NSTA there is material useful in the elementary school. Members are urged to acquaint elementary teachers with this and similar material and make it available for their use. It is planned that every issue of *The Science Teacher* will contain material useful to the teacher of elementary science in the elementary school. We hope that this will reach elementary teachers through secondary teachers who are members of NSTA. The association has published eight books that offer ideas and teaching suggestions of special use to elementary teachers.* It is hoped that secondary science teachers will acquaint elementary teachers in their school systems with this material. All meetings of the association will have some sessions devoted entirely to science teaching in the elementary school, some to the consideration of science teaching at all levels. These meetings are open to all elementary teachers, and we hope that thousands will learn of this opportunity through NSTA members.

Since many elementary teachers, as we have already indicated, feel insecure in teaching science, it is hoped that whenever possible secondary school teachers will assist these teachers by making their knowledge and skill available in such ways as are appropriate. In addition to those already suggested other examples of such help are: assistance in identifying specimens brought in by children and in seeing some of the possibilities for study, helping to plan field trips to further the understanding of science principles, and in suggesting apparatus, equipment, and other learning materials.

These are but a few of the possibilities of improving the science teaching at all levels through closer cooperation between elementary and high school teachers. It is through this closer relationship that greater continuity may be built into our science programs. When we take the total objectives for science teaching into account, the problem of overlapping which bothers some teachers diminishes in

* *Safety Thru Elementary Science* and *Science Teaching Today*: Vol. I, "Experiments With Water"; Vol. II, "Experiments With Air"; Vol. III, "Experiences With Fuels and Fire"; Vol. IV, "Experiences With Heat"; Vol. V, "Experiences With Magnetism and Electricity"; Vol. VI, "Experiences With Sound"; and Vol. VII, "Experiences With Light and Color." All are available from NSTA headquarters.

importance. Even if teachers at all levels worked to capacity, we still couldn't produce every pupil a *perfect* problem solver, *thoroughly* scientific in his attitude, *completely* appreciative of the wonders that surround him, or *thoroughly* acquainted with the generalizations and principles so essential to full living. Too many factors stand in the way of this realization; but with a concerted, integrated effort at all levels we could come closer to this goal than we now do.

The Committee

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AN ASSEMBLY PROGRAM for Science Clubs

By C. RICHARD SNYDER
Head of the Science Department
Lansdale, Pennsylvania, High School

As a teacher of science in a small high school of some 500 students, every year I am faced with the problem of putting on an assembly program. I realize the difficulty that is involved in doing interesting demonstrations before a large group, so I evolved the idea of dramatizing a few demonstrations, throwing in a little old fashioned "hokum," and calling the effort an assembly program. Too many science teachers are called upon to do unreasonable things, such as being a showman in addition to a classroom teacher, and this is an attempt to help them. There are no new or startling innovations in the experiments, but the way they are put together is, I feel, somewhat unique.

Chemagic

ANNOUNCER:

The Science Club now brings to you
A show of chemical magic—
If you should fail to get the point,
That would indeed be tragic.
We take you first to the Alchemist's lab,
That place of storied history,
Where the one big thought was to be obscure,
And keep all facts a mystery.

(*Curtains slowly part on an Alchemist's laboratory. The Alchemist is dressed in the garb of the time, and his apparatus consists of crude metal and glass vessels. A fire should be burning, and smoke should be evident.*)

ANNOUNCER:

This Alchemist, who seems to be
Extremely sad and curious,
Can't find the missing compound rare—
It makes him simply furious!
Here's lizards' tails, some snakes' sharp fangs,
But where's the missing villain?
Ah, yes, it's finally come to him—
He needs some Penicillin!

(*Alchemist claps hands. Assistant appears. They converse for a short while in pantomime. The assistant runs out and returns with enormous box labelled "Penicillin—sixty trillion units."* Curtains *close.*)

ANNOUNCER:

The Alchemists were very queer,
But they gave us a lot
Of facts about our universe,
And all of these they got
By trying things, and working hard,
And not attempting to seek
Their facts by argument alone,
As when this Greek met Greek.

(*Two students in Greek garb carrying scrolls meet in front of curtains. They argue and gesticulate in pantomime while announcer continues.*)

ANNOUNCER:

The Greeks believed that they
Should seek all knowledge out by reason,

And so they'd argue night and day
  In any time or season.
They recognized four elements:
  Earth, air, and fire, and water.
And only these four properties:
  Wet, dry, and cold, and hotter.

(*Students in Greek garb leave stage.*)

ANNOUNCER:

Now we believe an Alchemist
  Was smarter than a Greek
In using more than books and words
  When knowledge he would seek.
The only way to find things out
  Is give them all a trial.
This is a fundamental fact—
  There's really no denial.

(*Curtains open on stage set up for following demonstrations.*)

ANNOUNCER:

Now here we see a modern lab,
  With bottles, tubes, and such.
Of magic that cannot be done,
  There really isn't much!
Let's take the human breath,
  With which you're very well acquainted.
It isn't quite the simple thing
  It always has been painted.

(*Numbers in parentheses refer to demonstrations listed at the end. In all the demonstrations it is essential that the action on the stage and the words of the announcer be synchronized. This can be done if they watch each other carefully.*)

ANNOUNCER:

Now here we'll have three students
  Blow through rubber tubes, and see
If we can bring about
  For you a little mystery.
Our first experiment (1)
  Will change some water into milk.
While this is going on, we'll watch
  The others, smooth as silk!
Our second student blows his breath (2),
  And what is this we see?
From where is this smoke coming?
  Ah, yes, that's the mystery.
Now let us all watch number three (3).
  She gives a great big puff.
She really truly "blew her top"
  A strong breath, sure enough!

(*Curtains close long enough to change experiments.*)

ANNOUNCER:

There's something else that's never rare—
  This substance, H_2O;
That's "chemicalese" for water,
  Just in case you didn't know.
And just to prove that there's no trick
  In case that you should think
It really isn't water—
  Watch our chemist take a drink.

(*Student pours water from pitcher to cup and drinks it.*)

ANNOUNCER:

And now we'll take this water pure,
  And pour it in this jar (4)
And watch it turn to cherry red—
  This chemist's quite a star!
Now, just to make it really hard,
  He'll change it back for you,
And if you're still not satisfied,
  He'll turn it into blue.
Now let us take some more
  Of this mysterious, magic water (5)
And see if we can get it hot,
  And maybe even hotter.
We'll pour it right into this jar,
  And put a light to it.
Now take your time and watch it close—
  BOOM—there, it's lit!
Perhaps, if we should try real hard,
  And do our very best,
We'll put this magic water
  To a more exacting test.
We'll pour it from this pitcher
  To this final beaker here (6)
And see it snap and crackle.
  Now don't you think that's queer?

(*Curtains close for another change of materials.*)

ANNOUNCER:

This sugar's pure; it just came from
  A local grocery store,
But we can make it do queer things—
  Just watch it as we pour (7).
We put it in this beaker here.
  It soon will not be white.
It's now a black and gooey mass,
  Now isn't that a sight?
We know that you'd be very sad
  If something didn't explode,
But we don't have an atom bomb
  All ready for us to load.
Instead we take this ordinary,
  Common looking bucket (8).
If anything should fly your way,
  Just use your head and duck it!

(*Curtains close again.*)

ANNOUNCER:

We know that you all realize
That this has been in fun.
There's a simple explanation
For everything we've done.
You can do the self-same tricks,
On this we'll take a vow!
It isn't mystery or magic—
It's all in knowing how.
And now our show has reached it's close,
We've got to say "adieu,"
It's been a lot of fun to show
These magic tricks to you.
And now, as from assembly
Your weary way you wend,
We'd like to show in smoke and flame
This really is the END (9).

Experiments

1. Student blows breath into clear limewater. After a while, it becomes cloudy.
2. Student blows through two bottles, connected by tubing, one of which contains concentrated NH_4OH, the other, concentrated HCl. Keep the bottles hidden, of course, allowing only the two rubber tubes to show.
3. Dust explosion apparatus, consisting of a tin can, with a tightly-fitting lid. Inside the can—a lighted candle. A funnel, connected through a hole in the bottom of the can to a rubber tube, contains some lycopodium powder (flour will do). When student blows through rubber tube (be sure that the powder has not run out of the tube), a loud explosion results.
4. The jars contain, respectively, (a) some powdered phenolphthalein and some dry NaOH, (b) some dilute acid, (c) a blue dye such as methylene blue. Use very small quantities on the bottom of the jars so that they will be invisible to the audience.
5. The beaker has a few pieces of CaC_2 on the bottom. This will produce C_2H_2 gas with the water, and this may be ignited with a match or candle.
6. The beaker has several small pieces of Na on the bottom. No flame is needed.
7. The beaker into which the sugar is poured already has some concentrated H_2SO_4 on the bottom. Trial will show quantities needed.
8. Have some concentrated H_2SO_4 in a beaker in the bottom of the bucket. Pour in a small amount of $KClO_3$ and MnO_2 mixture—AND DUCK!
9. Paint the word "END" on a large piece of paper with a saturated solution of KNO_3. When it dries, it may be ignited at one end, and it will burn right along the word.

CAUTION: Some of these experiments (Nos. 2, 3, 5, 6, 8!) are dangerous if not performed carefully. Try them several times before attempting them in public.

THE CUTTING EDGE OF SCIENCE

Recent Developments in Research and Technology

Out of Thin Air

Scientists are now converting nitrogen of the air into nitric acid by the Wisconsin process, so named because the basic research was done at the University of Wisconsin. In principle, air is pre-heated by passing over a bed of hot magnesium oxide pebbles and is then used to support burning of a fuel gas. At the temperature produced—about 4000°F.—about two per cent of the air converts to nitric oxide. The gaseous mixture is then passed over another bed of magnesium oxide pebbles, but this time heat is removed so rapidly that the nitric oxide does not convert back to nitrogen and oxygen. All this takes place in a furnace designed for reversing the flow of air and burned gases periodically. The nitric oxide, of course, is recovered and converted to nitrogen dioxide which passes into water towers and forms nitric acid.

Theorized originally by Dr. F. G. Cottrell, the process research was carried on at UW by Professor Farrington Daniels and co-workers.

Pasteurization of Liquid Whole Eggs

An effective method of pasteurizing liquid whole egg has been developed through research by the U. S. Department of Agriculture. Heretofore, the industry has not known the time and temperature required for heating liquid egg to insure a complete kill of *Salmonella* bacteria without adversely affecting the commercial usefulness of the product. (*Salmonella* is a large and important genus with species characterized in general by ability to produce acid and gas by fermentation of glucose but not of lactose. Many of the species and varieties are pathogenic, often associated with food poisoning.)

The new method employs the type of equipment ordinarily used for pasteurizing milk, with little change in set-up. Tests have demonstrated that a process in which a temperature of 140°F., which is just below the coagulation level, is held for three minutes, proved effective in eliminating *Salmonella* under commercial operating conditions.

Indians in Illinois in 500 B. C.

Checking the radioactivity of carbon-14 in Indian relics and artifacts has "pushed back" the date of their origin more than 1500 years. So announces Professor John C. McGregor, University of Illinois archeologist. The materials used were clamshells found in a Hopewell Indian trash heap near Meredosia. Previously this Indian material had been estimated at some 800 years old; but radioactive carbon measurements indicate the age to be 2500 years, with a possible error of 300 years either way.

Artery Banks To Help Save Lives

Promising methods for successfully freezing and preserving blood vessel segments offer a good basis for the establishment of artery banks as practical and economic measures for saving lives and limbs, according to Dr. Henry Swan of the University of Colorado School of Medicine. His views and research results were recently presented at a symposium on blood vessel grafts, sponsored by the Surgery Study Section of the National Institutes of Health, Bethesda, Maryland.

"Artery banks are imperative if vascular surgeons are to cope with all clinical problems," said Dr. Swan. He pointed out that cold preservation of grafts without freezing is safe only for a period up to three or four months. He indicated, however, that "quick freeze" techniques have now advanced to a stage where more lasting preservation can be expected.

New Light on A-Bomb Radiation Effects

Most of the Japanese who were A-bombed in 1945 are today "perfectly normal except for a few scars," reports Dr. Paul G. Filmore, Duke University scientist recently returned from two years' work as a member of the Atomic Energy Commission Bomb Casualty Commission in Japan.

At the present time the only certain late effects are radiation cataracts of the eye, which are not a serious problem because they can be removed by a comparatively simple operation, he explained. Most people who developed cataracts are not seriously enough hindered to keep them from their jobs; most cases were discovered when the people were called in for clinical examination.

However, the ABCC is a long-term project that is continuing to look for other differences in exposed and non-exposed persons. The major divisions of the project are genetics, pediatrics, and medicine, although there are many supporting surveys such as the eye investigations.

Your Good Advice— Can Students Use It?

By ROBERT TYSON

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YOU COULD not count the number of times you have heard the following comments and queries:

"I can't understand the low mark on my test. I thought I knew the material very well."

"I always seem to put too much time on the wrong parts of the assignment."

"Somehow I can't plan my schedule to give enough time to all my subjects."

"I guess I just don't know how to study."

"How can I tell if I should specialize in your field?"

No doubt, in response to the appeals mentioned, you offered reasonable advice with respect to study habits, schedule, class behavior, vocational information, and other relevant topics. What determines the actual effectiveness of your counseling efforts?

The improvement of students who accept and apply admonition is a rewarding aspect of teaching. However, it is distressing to observe those who either cannot or will not put good suggestions to work. Perhaps the science teacher, with his natural leaning toward intellectual approaches, finds absence of logical self-direction particularly frustrating.

What practical approaches to guidance could help? A survey of current mental hygiene practices makes it possible to submit some comparatively simple guides (3).*

A student who consults a teacher about personal adjustment is like a patient who seeks psychiatric assistance from a general practitioner. Guidance problems are inevitably brought to the science teacher although he usually does not consider himself a specialist in guidance. However, as the first school authority sought out he wants to deal with the matter as effectively as possible. Let us consider what will decide the outcome of a conference between student and teacher.

The proper use of direct advice—no matter how good it may be—is closely related to the quality of control the counselee can exert. Ability to apply admonition depends, specifically, on the degree of conscious intellectual command the individual has over himself, as opposed to the sway of subsurface drives that are not only powerful but unknown to himself and to his adviser (1). The effectiveness of direct advice, then, is determined by the particular student's position on a continuum reaching from adequate self-direction to unconscious direction of his behavior.

When lack of information, poor training, and *mildly* unfavorable habits account for a student's personal troubles he can apply advice almost as efficiently as he can follow directions for an auto trip.

The success of admonition *in some instances* is not surprising. All forms of psychotherapy, from moralizing to psychoanalysis, achieve favorable results under certain conditions (2). It is when the symptoms—apathy, poor study habits, low grades, unfortunate behavior—are merely visible projections of other, more extensive problems, that the prospect is entirely different. Long-standing and deeply imbedded attitudes toward authority and responsibility, as well as guilt feelings, conflicts about important decisions, and other personality phenomena may be so compelling that no direct advice, however wise it may seem, can accomplish its purpose. Actually the counselee in that situation is as helpless as a person with a broken leg, who may be told quite cheerfully to rise above his troubles and make up his mind to walk normally.

Toward the end of the adjustment continuum where hidden motives are more and more to be reckoned with there is increased need for the slower, painstaking "uncovering" techniques of psychotherapy. The busy teacher lacks time for such procedures. In addition, the usual teacher-student relationship involves a type of authority

* Numbers in parenthesis refer to bibliography at the conclusion of the article.

and everyday contact that does not favor depth therapy.

How can the teacher determine the seriousness of a particular student's problem? How can he test the student's ability to profit from direct advice? Psychologists and psychiatrists who work continually with these questions are quick to acknowledge the difficulty of making an assessment. These working principles are offered:

1. Let the student "talk it out" at least briefly. Avoid the temptation to size up his problem quickly after a preliminary statement of his situation. Be careful not to put it into a ready category and offer a stock remedy.

2. After a reasonable opportunity to judge the student's problem, *try* advice. *The outcome of the intellectual approach provides its own test.*

3. When direct advice fails in the face of a persistent emotional difficulty, consider the mental hygiene resources of the school and community. Often neither the student nor his parents realize that this sort of assistance is available.

If specialized guidance is recommended, circumstances favoring its outcome are these: (a) sufficient discomfort on the part of the student to motivate him strongly, (b) a genuine desire to change, (c) willing acceptance of guidance, without external pressures, and (d) a reliably confidential relationship between the student and the selected consultant or agency.

In the period during which arrangements for specialized guidance are being made, the teacher can help by means of reassurance, interest and understanding, and any other "symptomatic relief" that may seem appropriate. These are the palliatives which so often tide a person over until truly curative steps can be taken.

The steps outlined can help to preserve the teacher's peace of mind and play a significant part in bringing selected problems to proper attention.

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HEALTH INSTRUCTION in the Biological Sciences

By CHARLOTTE L. GRANT
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The question continually arises, "Where shall health instruction be offered in the secondary school curriculum?" Training toward the development of satisfactory health habits is in the basic pattern of much elementary classroom teaching. Secondary school curricula are usually crowded with subject matter areas. There is little room for the introduction of more subject matter. Perhaps the time has come to evaluate the subject matter areas, to replace some timeworn subjects by those which have come to the foreground in today's way of life, or even to reorganize the curriculum around functional or life areas rather than subject matter areas.

The biological sciences offer a ready vehicle for the teaching of health. As an experimental procedure in one four-year high school of nearly three thousand students, a replacement of general science by a health science course is under way. This course is required of all ninth-grade students, for five or seven periods a week. There are usually 12 or 13 classes each semester, taught by instructors in the department of biological sciences. The experiment is approaching the end of its third year.

The course, although constantly undergoing revision as suggestions for betterment are received, is at present organized into four units. These are tentatively titled: *The Human Body, a Machine; The Young Person at Home; The Young Person at School and in the Community;* and *The Young Person at Leisure*. The first unit seeks to establish a basis for the next three by presenting to the student the human body as a unified whole—all cells, tissues, organs, and systems functioning together. A comparison to the machine, and the smooth working of its many parts, is made throughout.

Having constructed such a foundation, the second, third, and fourth units seek to build the health knowledges, attitudes, and habits necessary to keep the human machine in proper working order. Adequate diet, sound teeth, keen eyesight, good hearing, attractive skin and hair, healthful posture, rest, and sleep are some of the items covered in the second unit. Personal mental hygiene and family relationships are stressed. Housing from the standpoint of physical aspects, sanitary facilities, and safety procedures is touched upon.

The third unit considers the working environment of the young person. Lighting, heating, and ventilation are investigated in the school building, as well as sanitation, accident cause and prevalence, and fire hazards. The school day is completely analyzed with respect to health effects. Safety in school and on the way to school by automobile, bicycle, or walking receives considerable study and discussion. Some first aid demonstrations are recommended and enthusiastically given by class members. Community health studies and projects are undertaken by volunteers, and reports are made in class. Interviews are held with the school nurse, business manager, cafeteria manager, and others concerned with the health of the student body.

The fourth, and last, unit opens with a check list of leisure-time activities normally engaged in by high school people. Discussion follows, at the motivation of the teacher, with numerous additions to the list. Invariably the question arises "What about drinking and smoking?" Consequently, into this unit has come a rather detailed study of the use of alcoholic beverages, tobacco, and certain stimulants and sedatives * from the standpoint of affecting personal, family, and community health. No effort is made to tell a student what he should do about drinking and smoking. Scientific facts are presented, and he is left to draw his own conclusions for future action. Because of pupil requests to hear of the activities and hobbies of class members, reports and exhibits close this unit.

Health education is not forgotten at the end of the freshman year, but continues as an important part of the curriculum through four years of physical education and after-school recreational activities, through biology which is an elective science

* Other narcotics are being introduced for experimental teaching next semester.

after the freshman year, and through phases of home economics, social science, and English. Into biology has been placed the study of heredity, reproduction, growth from birth to maturity, boy-girl relationships, behavior mechanisms, disease control, and other human interest material. Since a large proportion of the sophomore class and a smaller proportion of juniors and seniors elect biology, perhaps little is lost by transferring these phases of health education to the more mature and stabilized student levels.

Health study in the biological sciences is coordinated with physical education, home economics, and social science through the activities of a school health council. Studies are in progress to show specific contributions from different teaching areas to health, to determine the health needs of students, and to set up definite projects in the various areas.

To be wholly successful, health education must ramify and permeate all curriculum areas. Every teacher must be alert to the health status of his or her students. Each classroom should be a healthful and pleasant environment. Working and social relationships through the school day should reflect the knowledge and application of health habits and attitudes.

Your Role in Teaching Moral and Spiritual Values

By GORDON E. VAN HOOFT

Assistant in Secondary Curriculum
New York State Education Department, Albany

THE SCIENCE TEACHER has an important role in any effective program of teaching moral and spiritual values. In New York State the recent emphasis given to this problem by the Board of Regents reflects a growing need for emphasizing high standards of morality. How to implement such a program in the schools is largely a matter of reemphasizing those practices always found in good schools and practiced by good teachers.

In rapidly changing times like these desirable current practices may be hidden behind a welter of confusing issues and pedagogical arguments. The individual teacher may have lost sight of the need to provide for pupil understandings and growth in this important area. The science classroom has always been a place where pupils meet some of the most fundamental experiences that lead to these understandings.

The following outline suggests areas in which the science teacher can be effective in teaching moral and spiritual values.

I. Developing the methods of science by:
   A. Providing a way of searching for the ultimate truth
   B. Building up a love for truth
   C. Learning to be honest with one's self
   D. Learning to face facts—not warping the truth
   E. Learning to judge the relative weight of the facts
   F. Learning to respect the opinions and beliefs of others
   G. Avoiding errors and correcting errors when they are discovered

II. Developing an appreciation of nature through:
   A. Recognition of the greater forces that affect all people
   B. Knowledge of the universal factors and forces of environment that operate irrespective of arbitrary dividing lines
   C. Realization of the interdependence of living things
   D. Observation of the perfections of our natural environment
   E. Appreciation of the varieties and complexities of living things
   F. Emphasizing the biological basis of the brotherhood of man

III. Developing an appreciation of the vastness and order of the universe by:

A. Correctly orienting the individual as an infinitesimally small part of a vast universe

B. Using the facts of astronomy to point up this vastness and order

C. Emphasizing that man, insignificant as he may be, has been endowed with the greatest ability to discover nature's laws

IV. Developing a resistance to propaganda and unfounded beliefs by:

A. Disproving false ideas, superstitions, and the like

B. Discrediting "false" sciences such as astrology

C. Protecting one's self against fallacies, illusions, misrepresentations, etc. by developing ability to analyze claims and see through false arguments

V. Developing correct attitudes toward personal and public health by:

A. Presenting all the facts in a positive approach to teaching the harmful effects of alcohol, tobacco, and narcotics—facts needed as the basis for individual decision

B. Taking effective precaution against spreading of disease

C. Building up knowledge of factors conducive to good physical and mental health

VI. Developing correct attitudes toward safety and conservation by:

A. Avoiding waste of materials and energy

B. Avoiding preventable accidents

VII. Developing the ability to work together through:

A. Illustrations of teamwork in science

B. Realization of need for free flow of scientific knowledge

C. Respect of leadership ability in others

The above outline is undoubtedly far from complete. It is merely suggestive of those opportunities that teachers have to assist their pupils in building desirable understandings apart from, or beyond, the strictly science content of the courses. In such a way science teachers in our schools can contribute their share in cooperation with the home and the church in developing the higher standards of morality necessary for the safeguarding of our democratic heritage and culture.

CLASSROOM ideas and demonstrations

Elementary Science

Learning the Constellations With "Tinker Toys"

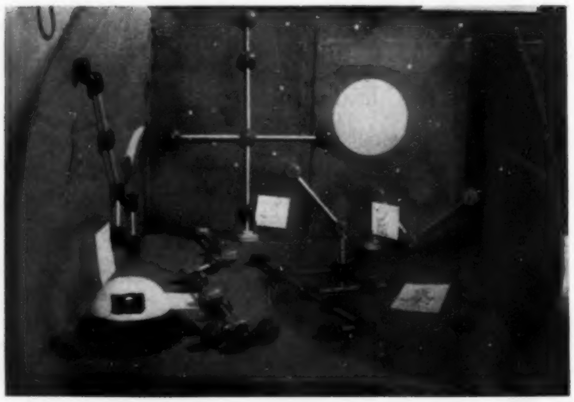
By EDWARD G. HALDMAN, Science Instructor, Salem High School, Salem, New Jersey

Here is an exhibit which has fired the imagination of many children in elementary science. It is a project which is not only educational but also provides entertainment.

Almost any home which has adolescents in it also has a set of construction toys, more commonly called "Tinker Toys." From the picture you can see that the children have housed the exhibit in a cardboard box and have painted it blue to represent space. To make it more representative of space they have added silver stars, a red sun, and an aluminum foil moon. With this as a start they found constellation maps and from these made the simpler and more familiar constellations. They used the sockets as stars and the sticks as connecting links. There are Draco—the Dragon, Casseopeia—the Woman in the Chair, Hercules—the Strong Man, Ursa Major—the Big Bear or Dipper, and Cygnus—the Swan. The observatory in the lower left of the picture was made out of wood as the personal project of one student.

Many students enjoyed making constellations in their own living rooms, and they went out to locate them in the heavens. This project also stimulated their interest in the stories of the ancient Greeks and acted as a motivating force in learning.

Some students developed their artistic abilities by drawing the identification cards. By using pro-



jects of this sort astronomy has become one of the favorite topics in our elementary science program. Try it for yourself, and see its amazing results.

Chemistry

Flame Tests

By CATHARINE C. BARNABY, Episcopal High School, Robertsport, Liberia

My science teaching has all had to be done with only alcohol burners and a very inadequate bit of platinum wire. Flame tests for metals, which should be fun, have been difficult. We could not compare the reds and yellows and be sure which were which. Potassium was always shy, and we never had enough pieces of blue glass. So I had the students put a little of the various salts in test tubes and half fill them with alcohol. Then the students poured the mixtures into evaporating dishes. The mixtures were lighted simultaneously. The flames

were easily compared, and the purple of the potassium showed up prettily. I suggest this experiment even for those of you who have plenty of platinum or nichrome wires.

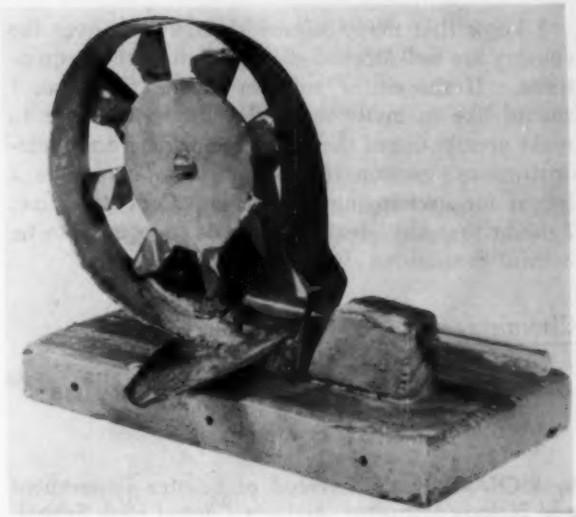
Physics

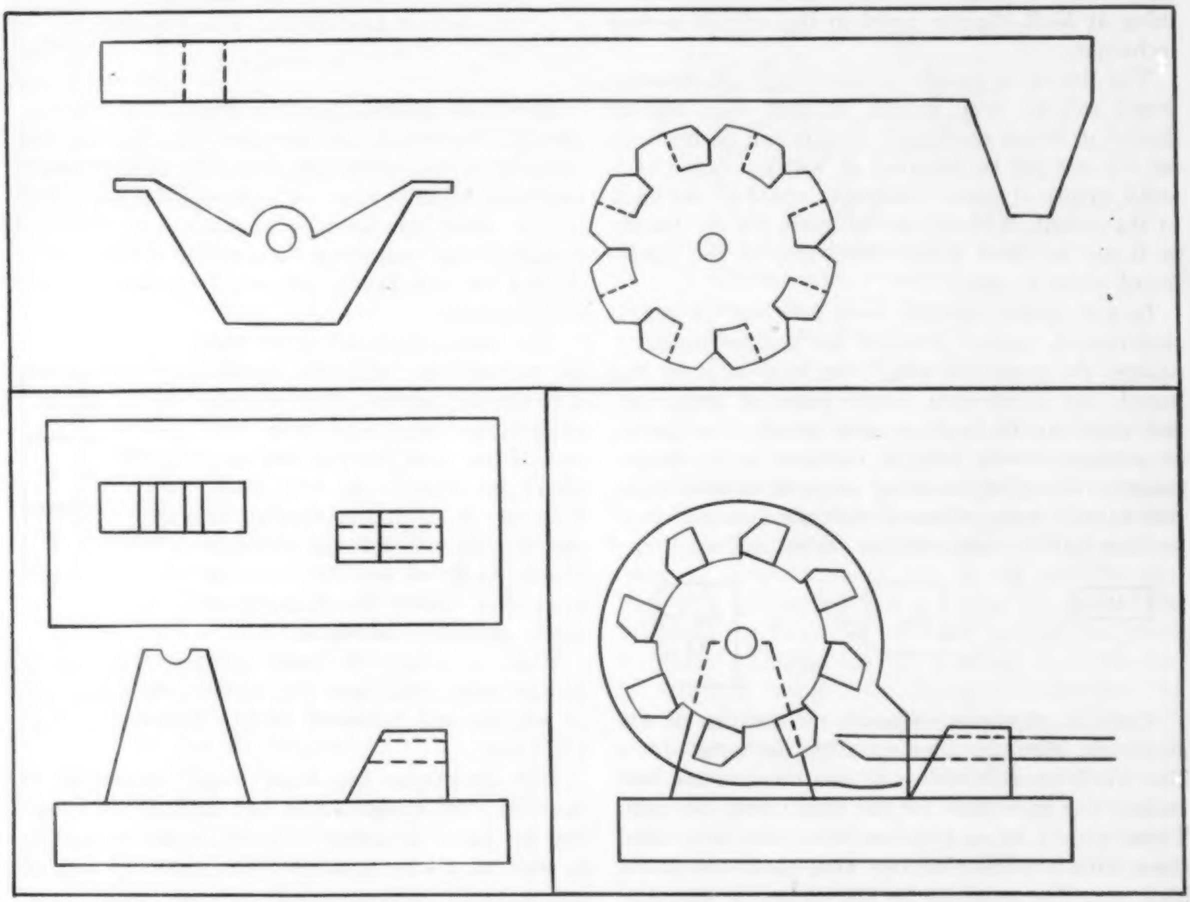
Demonstration Model of a Steam Turbine

By JAMES B. DAVIS, Head of the Science Department, Lower Merion Township High School, Ardmore, Pennsylvania

The model steam turbine shown in the accompanying photograph has served our physics department ever since a student constructed it about 15 years ago. For anyone else interested in duplicating this model, details given in the drawings should suffice for directions.

This kind of project intrigues many students. They get a kick out of devising and constructing equipment suitable for repeated use with other students in years to come. As the years do come, however, the new crop of students should be reminded that there is nothing to keep them from building "a better mousetrap" than their predecessors built.





I know that many science departments over the country are well stocked with student-devised equipment. If the editor will permit me to do so, I should like to invite my colleagues everywhere to make greater use of the "Classroom Ideas and Demonstrations" section in *The Science Teacher* as a forum for exchanging experiences along this line. I doubt that any idea or gadget is too simple to be helpful to someone else.

Chemistry

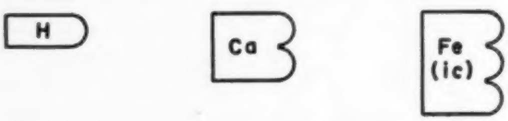
A Device for Teaching Formulas and Equations

By RICHARD H. LAPE, Head of Science Department and Biology Instructor, Amherst Central High School, Snyder, New York

The felt board is a rather recently developed teaching aid which is finding wider and wider application in the classroom. It is particularly well adapted to the introduction of formulas and equation writing in chemistry classes and provides something at least slightly novel in the way of a drill technique.

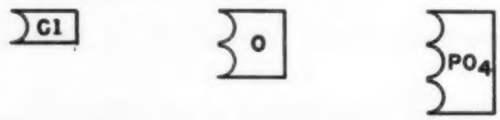
The device is merely a board (an old drawing board will do very nicely) covered with felt or flannel to which cardboard cutouts can be made to adhere and yet be removed at will by means of a small square of coarse sandpaper glued to the back of the cutout. A stand can be made for the board, or it can be stood in the chalk tray of the blackboard when in use.

In our school cutouts were prepared of heavy posterboard, yellow in color for greater visibility against the green felt which was used to cover the board, and a one-inch square piece of sandpaper was glued to the back of each cutout. Two pieces of sandpaper were used in the case of the larger cutouts. Those representing elements with a positive valence were prepared with semi-circular projections on the right side as shown below.



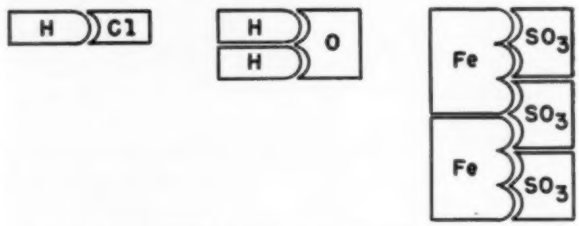
The size, of course, depends on the size of the classroom. However, they are all of the same width. The width used in this case was one-and-one-half inches. The basic unit for the height was one inch. Those with a valence of one were one unit high, those with a valence of two were made two units high, etc. The symbols for the elements were lettered uniformly with a speedball pen with letters one inch in height.

Similar cutouts were prepared for the elements and radicals with negative valences, placing indentations on the left side of the cutouts that would match the projections on the others.



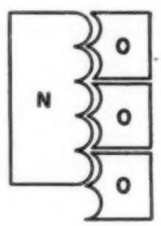
Formulas for various compounds then can be built by pressing the cutouts against the felt or flannel on the board so that all indentations on the cards are filled by projections as shown.

Elements entering into reactions with different valences will have to be provided with a separate cutout for each valence, with the appropriate number of projections or indentations.



It is thus possible to show graphically why two atoms of hydrogen are necessary to unite with one atom of oxygen, while only one atom of hydrogen is necessary to unite with one atom of chlorine, as well as the other relationships of valence in chemical formulas that can cause students so much trouble if they are not clearly grasped the first time they are presented.

The valence of a radical can also be worked out with this device. The unfilled depressions or unused projections remaining after the radical has been put together represent its valence. In drill work, however, it is much simpler to prepare cutouts for the radicals similar to those for the elements since they behave as elements in many chemical reactions.



With a supply of these cutouts, some cards marked with plus signs and arrows, equations can be written and balanced with a sufficiently large felt board.

This technique has been found successful in reaching some students who had difficulty in grasping the basic elements of formulas and equations as well as taking some of the monotony out of unfortunately necessary drill sessions.

The Flight of the Fruit Fly Brigade

By DAVID KRAUS, Biology Instructor, Far Rockaway High School, Far Rockaway, New York

One of the unexpected outcomes of the biology project room at the Far Rockaway High School was an enjoyable example of correlation between the project room and the English course as evidenced in the student-written poem below. Biology teachers may desire to use the poem for enrichment purposes in the topic of genetics.

In the project room, where students work one period daily on problems of their own choosing, Evelyn Katz has been engaged for a year in the study of mutant forms of Drosophila, the fruit fly. Apparently she has been simultaneously studying Tennyson in her English classes for one morning I found the following poem appearing in the school newspaper, *The Chat*.

The Flight of the Fruit Fly Brigade
(With a bow to Alfred Lord Tennyson)

By Evelyn Katz

Dedicated to those valiant "Drosophila Melanogaster" who give so readily of their lives and salivary glands for the sake of science and the study of heredity.

Half a wing, half a wing,
Half a wing onward,
Into the ether jug
Flew the six hundred.
Forward the fly brigade,
Straight toward the light they sped,
Into the jug of Death
Flew the six hundred.

Forward the fly brigade
Was there a bug dismayed?
Not though the creatures knew
From life they'd be sundered,
Their's not to make reply,
Their's not to reason why,
Their's but to turn and fly,
Into the jug of Death
Flew the six hundred.

Ether to right of them,
Ether to left of them,
Ether in front of them,
Drifting and ebbing;
Stormed at with light and smell
Meekly they flew, yet well,
Into the jaws of Death
Into the mouth of Hell
Flew the six hundred.

Flashed all their red eyes bare,
Flashed as they sped through air,
Stinging a labman there,
Charging a gas, while
All the world wondered.
Plunged in the drugging smoke
Through cotton wad they broke,
Small one and big one
Reeled from the choking smoke.
Then they fell limp, so limp
All that six hundred.

Ether to right of them,
Ether to left of them,
Ether in front of them,
Drifting and ebbing,
Stormed at with light and smell
Each "wild" or "dumpy" fell,
They that had flown so well
Lay in the jaws of Death,
Lay in the mouth of Hell
All that was left of them
Left of six hundred.

When can their glory fade
O' the wild flight they made;
The scientist wondered.
Honor the flight they made!
Honor the Fly Brigade,
Noble six hundred.

In the regular biology course an introductory lesson on genetics often includes the demonstration of bottles of mutant forms of living Drosophila. In addition I show a framed copy of the photograph of Drosophila which appeared on the front cover of *Scientific American* a few months ago. Now this photograph has taped on its back "The Flight of the Fruit Fly Brigade" so that the poem is readily available for oral reading, with full dramatic fervor, to the class. (In such manner does the teacher gradually accumulate a supply of "enrichment materials" which he fondly digs out again each term till they, or he, fall apart, or the curriculum changes.) The pupils enjoy the correlation, and I "digress" for a moment to show how a knowledge of science can make literature more interesting and meaningful.

Biology

A Digestion-Absorption Sequence

By MILTON S. LESSER, Acting Chairman, Biology and General Science Department, Thomas Jefferson High School, Brooklyn, New York

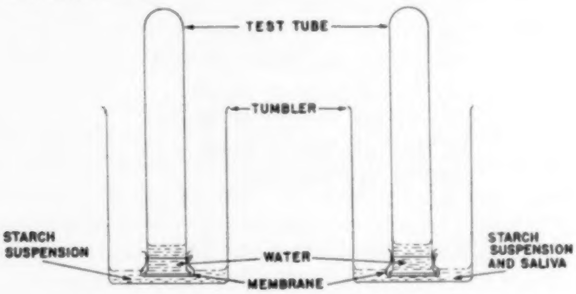
The sequence of activities described below is designed to show salivary digestion and absorption for classes in general science and biology.

Procedure:

1. With iodine solution demonstrate the presence of starch in a boiled starch suspension.

2. With Benedict's solution demonstrate the absence of simple sugars in this starch suspension and in freshly collected saliva.

3. Mix some of the starch suspension with the saliva; keep the mixture warm for five minutes. Before proceeding further, pour some of this mixture into a tumbler to within one-quarter inch of the bottom.



4. Show that simple sugars are present in the original sample of the mixture and in the portion poured into the tumbler.

5. Discussion, recording, etc., should be carried out at this point to elicit the essentials of salivary digestion.

6. A. Pour water into a test tube to within one-half inch of the base. Cover the mouth of the tube with a piece of goldbeater's membrane. Fasten the membrane in place with a rubber band.

B. Invert this tube and set its mouth below the surface of the saliva-starch mixture in the tumbler.

7. Show the absence of simple sugars in another sample of water from the same source as that used in step 6-A.

8. Set up a control with starch suspension alone in another tumbler. Invert another test tube of water in this tumbler as in step 6-B.

9. In about 15 minutes, remove the tubes, rinse them, and remove their membranes and carry out the following:

A. Test the contents of the tube used in step 6 with Benedict's solution. A small percentage of sugar is detectable. (If a longer interval is allowed, or if warm water baths are employed, a more pronounced color change will be evident.)

B. Test the contents of the tube used in step 8 with iodine solution. Starch is not detectable.

C. Carry out any other tests suggested by the pupils.

(Note: An element of realism may be added by substituting a soda cracker for the starch suspension. This may, however, introduce other complicating factors.)

10. Discussion at this point should clarify the principles of the necessity for digestion, as well as the analogy to the absorption by a villus or by a cell.

Values of this method:

1. It permits the drawing of conclusions from observed data.

2. There is provision for thinking with the safeguard of controls.

3. It lends itself to either demonstration or individual laboratory work.

4. The digestive function of saliva is shown.

5. The general concept of absorption is demonstrated.

6. It provides a continuous sequence from the necessity for digestion, to the process of digestion, through the absorption of a nutrient, without the introduction of additional complicating demonstrations.

Books and Pamphlets Received

The Story of Metals. John W. W. Sullivan. 290 pp. $3.00. The Iowa State College Press. Ames, Iowa. 1951.

The Nature of Metals. Bruce A. Rogers. 248 pp. $3.00. The Iowa State College Press, Ames, Iowa. 1951. These two books will provide interesting and instructive reading for adults and for the more serious-minded high school and college students. The first book is the more general, of course, with the second one definitely on the technical side. Both books contain glossaries, and the second contains an extensive bibliography of references.

Alcoa—An American Enterprise. Charles C. Carr. 292 pp. $3.50. Rinehart & Company, Inc. New York. 1952. A story of Charles Martin Hall and of the Aluminum Company of America, an American enterprise that grew out of Hall's work.

NSTA Activities

▶ *Information* About Summer Conference at the University of Michigan

First, there's the Workshop in the Teaching of Science in the Elementary and Secondary Schools. It runs from June 23 through July 3. You can enroll for a fee of $30 (or $20 if a resident of Michigan), and you can gain two hours of undergraduate or graduate credit. Here's how:

If you wish to enroll for graduate or undergraduate credit and have not previously been admitted to the university you should submit at the time of enrollment official evidence of your status. Graduates will be expected to have in their possession a letter or other credentials showing that they have an undergraduate or graduate degree or have graduate standing from another institution. Undergraduates should have a letter from a college official stating that they were in good standing when they were last enrolled. A transcript is not necessary.

If you wish to be admitted to the university as a regular rather than a special student, write as early as possible for an application for admission (as a graduate) to the Horace H. Rackham School of Graduate Studies, or (as an undergraduate) to the School of Education or the College of Literature, Science, and the Arts. Graduates will be admitted to the Horace H. Rackham School of Graduate Studies and undergraduates to the School of Education.

There'll be top-flight instruction, too. Director of the workshop will be Dr. Francis D. Curtis of the University of Michigan. Other staff members will include Dr. Lawrence A. Conrey, University of Michigan; Dr. George D. Mallinson, Western Michigan College of Education; and Dr. E. Eugene Irish, Ball State College.

Rooms for participants in the workshop and in the conference during June 26-28 have been reserved in one of the newest UM dormitories. The cost, including three meals daily, is $5.00 per day. Pamphlets describing the workshop and conference programs and containing application forms for reserving accommodations will be mailed to NSTA members around April 1st. *These should be filled out and mailed to the university as soon as possible and not later than June 14.*

The NSTA Board of Directors will meet on June 24 and 25. That's the second attraction for a large turnout of members. And third, of course, is the three-day conference, June 26-28, with the theme, "Down to Brass Tacks," as the guide to programming. Thursday the 26th will be devoted to another conference on industry-science teaching relations. The exhibit of science teaching materials from more than a dozen commercial sources will open on this day, and it is expected also that there will be displays by other science teaching societies. Thursday evening will be given over to a mixer and social affair.

Speakers from the university science departments are being programmed to participate in professional sessions on Friday the 27th, which will also provide work-group opportunities. A dinner session will wind up the day.

Emphasis on classroom practices and teaching techniques will be the focus of Saturday a. m. meetings. Then there will be a conference luncheon with reports and summaries, followed by a sort of symposium on "inside NSTA today." By 2:30 the afternoon of the 28th, you should be in the clear to head for Detroit and the NEA delegate assembly —or to turn your car homeward—or to strike out for vacation in Michigan or Canada.

THE COMMITTEE

▶ *Awards* Program for American Society for Metals

Detailed announcement of the awards program for science students and teachers to be conducted by NSTA for the American Society for Metals has been delayed somewhat pending clarification of policies and schedules. The committee has held several meetings in Washington and has been in constant consultation with ASM. A bulletin board poster announcing the program will be mailed around March 1st to all NSTA members and about 12,000 other science teachers on the NSTA mailing list. The bulletin will carry suitable application forms for entry in the awards program.

A phase of the program expected to have unique and important results is that involving the teacher

awards. To be based on reports of tried and tested, effective ways of stimulating student interest and activity in the study of science, these reports will be collated, edited, and published in a special booklet for widespread distribution to as many science teachers as we can reach. The American Society for Metals has generously agreed to print this booklet at no cost to NSTA.

Time schedule for the ASM awards program has been revised. Entry forms and regulations may be obtained by writing to the NSTA headquarters office. Entries must be in the hands of the committee not later than May 30, and the various awards will be made on or before September 15, 1952.

ASM Awards Committee

Comprehensive Action Program for Future Scientists Adopted by NSTA

The nation as a whole is faced with a shortage of scientists for research, engineering, teaching, and technology. The shortage of supply and excellent opportunities for careers in these fields promise to continue for some indefinite period. Ways of coping with related problems at pre-college levels have received much consideration by NSTA—in the Edison Foundation Institutes, for example, in other conference groups, by our committee on professional projects, and by our Board of Directors.

A five-pronged action program has been developed and was formally adopted by the NSTA Executive Committee at a meeting in Washington February 9-10. The program is already being activated in part, although certain phases will require more time to assure thorough and complete planning. Brief descriptions of the five lines of action follow.

1. *Science student accomplishment awards.* To encourage wide use of individual and small group experiments and projects at junior and senior high school levels. To stimulate early and lasting interest on the part of students in science and to provide recognition awards for their accomplishments. This phase of the program has been launched by the ASM awards.

2. *Science teacher recognition awards.* To recognize by suitable means the contributions of outstanding teachers of science at pre-college levels. To encourage effective science teachers to remain in teaching. To develop channels for good ideas and "know-how" to spread from outstanding science teachers to others.

3. *Research in science teaching.* Example projects: to develop tests and other means for the early identification of students with high potential for success in science; to determine positive ways to aid students with high potential to reach high performance; to find solid reasons why enrollment in high school physics and related mathematics is falling off; to produce materials that will strengthen science teaching in critical science areas.

4. *Institutes and workshops for science teachers.* To develop special study opportunities for science teachers. To help science teachers discover by first-hand experience what science, engineering, and technician work is like. To come to close grips in small working groups with many of the instructional problems in science at all pre-college levels.

5. *Future scientists of America.* To undertake for future scientists, engineers, science teachers, and technicians the good being done for future farmers, future business leaders, and others. To channel to science students career information on science and engineering. To encourage wide use of occupational information in science classes and in career conferences at local, state, or regional levels.

Planning for action along the lines described has already involved consultation with representatives of professional scientific and engineering societies, of other educational organizations, of foundations interested in science and engineering, and of business and industrial organizations in the fields of science. Geared to the highest levels of cooperative endeavor, the NSTA program promises to receive wholehearted moral and financial support from the various groups just mentioned. Progress reports will appear from time to time in *The Science Teacher* and through other media as developments mature.

Arthur O. Baker, *NSTA President and Chairman of Executive Committee*

New Policy of Regional and National Meetings Adopted

Acting on the theory that it is good policy to take NSTA meetings out to science teachers everywhere, rather than expect heavy national representation at the summer conference (with NEA) and at the winter meeting (with AAAS), the Executive Committee has approved a plan to provide regional meetings and one national meeting of NSTA each year. By this plan it is expected that there will be an NSTA meeting within easy travel distance of nearly every science teacher in the country at least once every two or three years.

The two meetings with NEA and AAAS will henceforth be regarded as regional with a third to be sponsored in the fall of each year. The first of

these fall regionals has been approved for Atlanta, Georgia.

It has been decided to hold an annual meeting in the spring of each year on a "national" basis and with all the attractions and features of other national organizations, including a large commercial exhibit. The first of these national meetings has been scheduled for the spring of 1953, but the location has not been decided upon.

Looking back a bit and forward a year, here is the schedule of NSTA meetings:

Regional summer conference, 1951—Oakland, California

Regional winter meeting, 1951—Philadelphia, Pennsylvania

Regional summer conference, 1952—Ann Arbor, Michigan

Regional fall conference, 1952—Atlanta, Georgia

Regional winter meeting, 1952—St. Louis, Missouri

National meeting, 1953—Location undecided

ROBERT H. CARLETON
Executive Secretary

Books and Pamphlets Received

Stars. Herbert S. Zim and Robert H. Baker. 157 pp. $1.00. Simon and Schuster, Inc. New York. 1951. Another in the series of "Golden Nature Guides," which, of course, speaks volumes for the value of the book. This one is a guide to the constellations, sun, moon, planets, and other features of the sky. Upper elementary to adults will read and use the book with profit.

Workbook of Scientific Thinking. No. I. The Chemical Background of the Atom. Brenda Lansdown. 68 pp. $1.00. The Dalton Bookshop. New York. 1950. High school and junior college teachers interested in working toward objectives implicit in the title of this book will certainly want at least an examination copy. The subject matter of the book is an historical treatment of ideas about "the bricks of the universe."

Employment, Education, and Earnings of American Men of Science. Bulletin No. 1027, U. S. Department of Labor. 48 pp. 45 cents. U. S. Government Printing Office. Washington, D. C. 1951. This bulletin furnishes hitherto unavailable information on the education and experience of the nation's leading scientists. Scientists studied were predominately research workers. Next to research, teaching was the activity most often reported. Chemists comprised about one-fourth of the scientists listed; biologists were second in frequency, and engineers third. Salaries for Ph.D.'s were considerably lower in colleges and universities than in either government or private industry, median salaries being $7070 in private industry, $6280 in government, and $4860 in education. The study covers 42,000 of the 50,000 scientists listed in the 1949 edition of *American Men of Science.*

This Fascinating Animal World. Alan Devoe. 303 pp. $3.75. McGraw-Hill Book Company, Inc. New York. 1951. One of the country's most popular nature writers has produced this interesting and readable book to answer a multitude of questions such as: Do fish hear? Can snakes hear? Do snakes swallow their young? How long does an elephant carry its young? Students and other readers from about junior high level upward can read this book for a rounded picture of the animal world or dip into it at random for provocative information.

Logic for Living. Jane Ross Hammer, Editor. 281 pp. $3.75. The Philosophical Library. New York. 1951. Based on stenographic notes, this book reports actual classroom discussions of Henry Horace Williams, University of North Carolina philosopher and teacher in that institution for nearly half a century. Provocative statements of idealistic non-symbolic logic and its applications to problems of action in the modern world.

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